University of Alberta

What to Expect from Expectations

by

Dejan Ozegovic ©

A thesis submitted to the Faculty of Graduate Studies and Research
in partial fulfillment of the requirements for the degree of

Master of Science
in Epidemiology

Department of Public Health Sciences

Edmonton, Alberta
Fall, 2008

Library and
Archives Canada

Published Heritage
Branch

395 Wellington Street
Ottawa ON K1A 0N4
Canada

Bibliothèque et
Archives Canada

Direction du
Patrimoine de l'édition

395, rue Wellington
Ottawa ON K1A 0N4
Canada

Your file Votre référence
ISBN: 978-0-494-47382-5
Our file Notre référence
ISBN: 978-0-494-47382-5

NOTICE:
The author has granted a non-exclusive license allowing Library and Archives Canada to reproduce, publish, archive, preserve, conserve, communicate to the public by telecommunication or on the Internet, loan, distribute and sell theses worldwide, for commercial or non-commercial purposes, in microform, paper, electronic and/or any other formats.

The author retains copyright ownership and moral rights in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author's permission.

AVIS:
L'auteur a accordé une licence non exclusive permettant à la Bibliothèque et Archives Canada de reproduire, publier, archiver, sauvegarder, conserver, transmettre au public par télécommunication ou par l'Internet, prêter, distribuer et vendre des thèses partout dans le monde, à des fins commerciales ou autres, sur support microforme, papier, électronique et/ou autres formats.

L'auteur conserve la propriété du droit d'auteur et des droits moraux qui protège cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

In compliance with the Canadian Privacy Act some supporting forms may have been removed from this thesis.

While these forms may be included in the document page count, their removal does not represent any loss of content from the thesis.

Conformément à la loi canadienne sur la protection de la vie privée, quelques formulaires secondaires ont été enlevés de cette thèse.

Bien que ces formulaires aient inclus dans la pagination, il n'y aura aucun contenu manquant.

Canada

Abstract

Background: Expectation for global recovery and return to work are important prognostic factors for health outcomes. What remains uncertain is what factors are associated with expectations, and what is the relationship between return to work expectation and self-reported recovery?

Methods: Using a population based cohort of individuals injured in a motor vehicle collision, we used baseline data to examine a variety of factors associated with return to work and global recovery expectation, and follow-up data to examine the relationship between return to work expectation and self reported recovery.

Results: Factors most strongly associated with expectations were depressive symptomatology, and neck/shoulder pain. All the factors associated with return to work expectation were also significantly associated with global recovery expectation. A positive return to work expectation was associated with a 42% faster rate of recovery.

Conclusion: This study has potential clinical implications which could improve health outcomes by addressing expectations.

Table of Contents

Chapter 1: Literature Review of Neck Pain....................................1

Section 1.1 Whiplash Associated Disorders..1

Section 1.2 What is the Incidence and Prevalence of Neck Pain in the General Population..5

Section 1.2.1 Factors Associated with Incidence and Prevalence in the General Population...7

Section 1.3 Incidence of Whiplash-Associated Disorders........................8

Section 1.4 Incidence and Prevalence of Neck Pain in Workers................10

Section 1.4.1 Risk Factors for Neck Pain Among Workers................11

Section 1.5 Course and Prognosis of Neck Pain..................................13

Section 1.5.1 Importance of Course and Prognosis..........................13

Section 1.5.2 Course and Prognosis of Neck Pain in the General Population...14

Section 1.5.3 Course and Prognosis of Neck Pain in WAD................16

Section 1.5.3 Course and Prognosis of Neck Pain in Workers............22

Chapter 2: Review of the Expectations Literature..............................25

Section 2.0 Recovery Expectation..25

Section 2.1 What Does 'Expectation' Mean?......................................25

Section 2.2 Why Study Expectation?...27

Section 2.3 How Do Expectations Work?..28

Section 2.3.1 Interventional Studies..28

Section 2.3.1 Non-intervention Studies……………………………….32

Section 2.4 What Factors Influence Expectation?.......................................34

Section 2.5 Expectation Formulation………………………………………37

Section 2.5.1 The Importance of Perspective for Outcome Evaluation…37

Section 2.5.2 Influences of Biopsychosocial Factors on Recovery Expectation……………………………………………………………...40

Section 2.5.3 The Influence of Relationships and Socialization on Behaviour and Cognition……………………………………………………………..40

Section 2.5.4 The Influence of the Family………………………………42

Section 2.5.5 The Influence of Culture…………………………………43

Section 2.5.6 Influences of Socialization Over the Life-Course………..44

Section 2.5.7 The Role of Self-Efficacy in Recovery Expectation……..45

Section 2.5.8 Self-Efficacy and Influence on Cognition………………..46

Section 2.6 Development of a Pragmatic Conceptual Model for Recovery Expectation…………………………………………………………………52

Section 2.7 A Need for Further Evaluation…………………………………59

Chapter 3: Factors Associated with Expectations…………………………83

Section 3.1 Introduction……………………………………………………85

Section 3.2 Objectives………………………………………………………86

Section 3.3 Study Design, Population and Data Collection………………..87

Section 3.4 Inclusion and Exclusion Criteria………………………………88

Section 3.5 Potential Explanatory Factors…………………………………89

Section 3.6 Dependent Variables……………………………………………91

Section 3.7 Statistical Analysis……92

Section 3.8 Results……95

Section 3.8.1 Global Recovery Expectation Cohort……95

Section 3.8.2 Return to Work Expectation Cohort……103

Section 3.9 Discussion……107

Section 3.9.1 Recovery Expectations……108

Section 3.9.2 Return to Work Expectation……111

Section 3.9.3 Similarities and Differences in Factors Associated With Global Expectations of Recovery and Expectations to Return to Work……113

Section 3.10 Strengths and Limitations……114

Chapter 4: The Relationship Between Expectations to Return to Work and Global Recovery……124

Section 4.1 Introduction……126

Section 4.2 Population and Data Collection……127

Section 4.3 Inclusion and Exclusion Criteria……128

Section 4.4 Exposure……130

Section 4.5 Outcome……130

Section 4.6 Potential Confounders……130

Section 4.7 Analysis……132

Section 4.8 Results……134

Section 4.9 Discussion……139

Section 4.10 Strengths of Analysis……141

Section 4.11 Potential Biases/Limitations..142

Section 4.12 Conclusion..143

Chapter 5: Conclusion: What Does It All Mean?..149

Appendix 1: Addition of a Trichotomous Position in Vehicle Variable......153

Appendix 2: Characteristics of the Group Answering "Not Applicable"......155

Appendix 3: Assessing the Effect Modification Variables......................156

Appendix 4: Conceptual Model for Expectation Development................158

Appendix 5: Model Diagnostics for Global Recovery and Return to Work Expectation..159

Appendix 6: Correlation Tables for Variables Used in the Two Research Studies..160

Appendix 7: Health Research Ethics Approval Form...........................162

The purpose of this thesis is to explore factors which may be associated with positive expectations for global recovery and positive expectations for return to work following vehicle collision and resulting whiplash associated disorder (WAD). A further purpose is to explore the association between positive expectations for return to work and actual self-reported recovery. The format of this thesis is as follows: firstly, I discuss the issue of neck pain in three populations (those with whiplash associated disorders, the general population and workers). Next I discuss the relevance of expectations as an important variable in recovery from a variety of health conditions and illnesses. The two completed research studies are reported separately followed by a general conclusion section and relevant appendices.

Chapter 1- Literature Review of Neck Pain

1.1 Whiplash-Associated Disorders

The World Health Organization estimates that worldwide, 20-50 million people are injured or disabled each year following motor vehicle collision, with 1.2 million annual deaths (1). It is anticipated that these figures will increase by as much as 65% over the next 20 years, and motor vehicle injuries will become the 3rd largest contributor to global disease burden by the year 2020 (1). Motor vehicle collisions rank as the 11th leading cause of death, and account for 2.1% of all deaths globally. The economic burden of traffic collisions is estimated at US$518 billion globally, with low and middle income countries accounting for US$65 billion of this amount. To put this in perspective, the cost to middle and low income countries from motor vehicle collisions accounts for more than the development assistance money received by them from developed nations.

Regardless of the nation, this important public health problem puts a significant strain on healthcare systems worldwide (1).

The majority of non-life threatening injuries following motor vehicle collisions are the result of whiplash mechanisms, and these have been termed whiplash-associated disorders (WAD) (2). WAD includes a range of clinical manifestations including muscular pain (neck and back), dizziness, headache, nausea, neurological symptoms (paresthesia or numbness), cognitive dysfunction (poor memory or concentration), and visual/hearing disturbances or a combination of these. In industrialized countries, the problem of WAD has become increasingly costly and more common for health and insurance systems creating dilemmas in medico-legal and social arenas. This is due to the fact that some people experience prolonged disability and pain as a result of their injury (3).

WAD symptoms are postulated to arise from mechanical trauma of the supporting ligaments and muscles of the cervical spine, which may cause soft tissue damage as well as instability to various joints or ligaments. However, a direct link between the sources of pain, and resulting disabilities have yet to be causally associated with some proposing that WAD symptoms should be classified as an event rather than an injury since a pathophysiological process can not be identified in some cases. A range of biomechanical research studies have been published which try to elucidate the mechanisms by which WAD symptoms are triggered. A central area of interest is determining the minimum threshold of force during a vehicle collision that is required to produce WAD (4). This research has been performed on human volunteers, cadavers, animals as well as crash test dummies (4-6). Looking at only biomechanical variables has not provided complete answers, largely because WAD is determined by a combination of factors: firstly, some exposure to a whiplash mechanism such as a vehicle collision, and secondly, personal, societal and environmental characteristics (7).

A factor that impacts on the clinical assessment of symptoms of WAD is the high prevalence of neck pain and other WAD-like symptoms in the general population (in those who have not been involved in vehicle collisions) (8). This makes it difficult for clinicians and researchers alike to untangle whether those with WAD symptoms are experiencing symptoms which are new, and thus attributable to the collision, or whether they are exacerbations of a condition which already existed prior to the collision. As such, researchers suggest an individual's reports of symptoms should be complimented with a clinical examination for detection of any objective signs as well as information on the frequency, duration and intensity of any prior neck pain. This can be difficult, however, since patient recall of prior symptoms is often discrepant with prior medical records (9).

Despite the absence of a gold standard diagnostic test to detect WAD such as x-ray, computerized tomography (CT) or magnetic resonance imaging (MRI), clinicians may impact in reducing the burden of by WAD by 'ruling out' more serious causes for neck pain following collision (e.g. serious pathology such as dislocation, fracture, etc.). This may assist in providing reassurance to individuals and reduce perceptions of WAD as a potential cause for lasting disability.

The Quebec Task Force on Whiplash-Associated Disorders (QTF) thus proposed an injury grading system to assist clinicians, policy makers and other stakeholders in the classification and management of WAD. The grading system, based on clinical and patient reported findings, range from Grade I – IV, with Grade I involving reported symptoms only without clinician elicited physical signs, and grade IV involving a fracture/dislocation confirmed with imaging. The aim of the QTF was to provide evidence-based guidelines for acute WAD care following a vehicle collision, with WAD classification becoming an important component of this process.

More recently, and under a similar premise, the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders (NPTF) has proposed a four-grade classification scheme for neck pain (of traumatic and non-traumatic origin) that considers perceived limitations as well as physical signs and diagnoses (10). This classification scheme is as follows:

Type I neck pain: complaints of neck pain and/or its associated disorders with stiffness or tenderness but no other physical signs noted by the examining clinician. No symptoms or signs to suggest major structural pathology and no or minor interference with functioning. Major structural pathologies include fracture, vertebral dislocation, injury to the spinal cord or nerves, infection, neoplasm or systemic disease including the inflammatory arthropathies

Type II neck pain: complaints of neck pain and/or its associated disorders and major interference in functioning. No symptoms or signs to suggest major structural pathology. Interference with functioning can be documented with self-report questionnaires.

Type III neck pain: complaints of neck pain and/or its associated disorders where the examining clinician notes neurological signs such as decreased deep tendon reflexes, weakness and/or sensory deficits. These suggest malfunction of spinal nerves or the spinal cord. The mere presence of pain or numbness in the upper limb that cannot be confirmed by definitive neurological findings and consistent pathology does not warrant a grade III neck pain designation.

Type IV neck pain: complaints of neck pain and/or its associated disorders with signs or symptoms that suggest major structural pathology and require expedient assessment to diagnose and treat, thus avoiding permanent structural damage.

1.2 What is the Incidence and Prevalence of Neck Pain in the General Population?

Determining the significance of the problem of neck pain includes identifying the frequency of new cases (incidence) and determining the existing burden of neck pain in the population (prevalence). This can assist with both appropriate health care planning and implementation of prevention strategies that target individuals at greatest risk. A recent best evidence synthesis on neck pain in the general population has been completed and provides results from 101 scientific papers related to the burden and determinants of neck pain in the general population (8). The review authors state that different methods of ascertainment of cases among studies often resulted in differing incidence and prevalence estimates. Variations in reported frequency can be, in part, attributed to variations in the case definitions for what constitutes neck pain (such as the duration of pain), whether neck pain is self-reported or diagnosed by a clinician, and whether or not the individual reported to the hospital with complaints.

Self-assessment questionnaires were noted to result in the highest reported incidence estimates (179 per 1000 persons for individuals reporting pain lasting greater than one day during the past year and were initially pain free) (11) followed by estimates examining health care visits (78.5 per 1000 person years for those reporting to a health care center for neck pain) (12) and the lowest from studies of neck injuries presenting to a hospital or emergency department (0.055 per 1000 person years for those diagnosed with disc protrusion/herniation with radicular syndrome) (13).

A synthesis of the data on prevalence of neck pain in the general population also showed large variations in estimates, and prevalence estimates also varied with respect to the time period of interest (8). The authors reported that studies reporting point prevalence generally showed lower estimates than one, six or 12 month period prevalence or lifetime prevalence of neck pain (i.e. as the period of time increased the prevalence of neck pain generally increased). If pain was qualified more specifically, such as higher frequency of occurrence, increasing interference with activity, and longer duration, the estimates of prevalence were smaller. As with the incidence figures, estimates of very specific diagnoses, such as radiculopathy, were much lower than the estimates of any pain or pain that limited activity (8).

One-month prevalence estimates vary between 15.4-45.3% in adults and 4.5-8.5% in children. When this is qualified by whether the pain occurs frequently, (frequency of at least weekly pain) prevalence estimates in adults drop to 12-14%; and to 7.5-14.5% when considering pain that interferes with activity. Twelve-month prevalence estimates varied from 12.1-71.5% among adults and 34.5-71.5% in children (most estimates between 30-50%). Approximately 1.7% of adults report limited ability to work due to neck pain, 2.4% report limited social activities, and 11.5% reported limited other activities due to neck pain.

The study authors concluded that neck pain is common in the general population. Also, there appears to be an "iceberg" effect for neck pain (8). What this means is that what may be seen in the population are many cases of 'some' neck pain that individuals will experience, but fewer cases of pain that causes individuals to seek health care, and even fewer who become disabled due to their neck pain (8).

1.2.1 Factors Associated with Incidence and Prevalence in the General Population

The NPTF reported several predictive factors for developing a new episode of neck pain, as well as factors associated with prevalent neck pain within the general population (7).

Many scientific papers were reviewed with factors such as age (noted that neck pain prevalence increases with age and peaks in the middle years, with a decline in frequency in later years), gender (higher prevalence for women than men), prior health (history of health care use for a variety of health issues, and history of neck pain were risk factors for the development of neck pain) (11,14), psychological and social factors (poor psychological health was associated with neck pain in children and adults in a preponderance of the evidence identified) being identified as important (8).

1.3 Incidence of Whiplash-Associated Disorders

The incidence of reported WAD has increased in the past 30 years, (as assessed by increased visits to hospitals and emergency departments following vehicle collision) (7). Incidence estimates reported among countries vary significantly with estimates between 27.8 per 100,000 population in the United Kingdom (15) to 417 per 100,000 population in Saskatchewan, Canada under a tort law system (16). The NPTF authors reported that it is unclear if the observed increase noted in some western countries is a true increase in the frequency/severity of WAD since these figures may reflect a change in care-seeking behaviour for suspected neck injuries following a vehicle collision, or could reflect changes in how such injuries are coded in health records (7).

1.3.1 Risk Factors for WAD

Evidence reported for the effect of gender appears to be inconsistent, with some studies reporting that females have a slightly increased risk of developing WAD following a vehicle collision (7). Studies that recorded attendance to hospital following collisions noted females were more likely to seek care than males (17), and three studies that evaluated insurance claims found females to be at slightly increased risk of WAD (or at least, WAD claims) compared to males (16,18,19). This evidence parallels the findings noted for neck pain in the general population where females were also noted to be at increased risk to develop neck pain. There is also evidence to suggest that prior neck pain increases the chance for developing WAD following a collision. Since females are more likely to experience neck pain prior to a vehicle collision, they could therefore be at increased risk for developing resulting WAD symptoms after a traffic injury (7).

The influence of age is also important for the development of WAD with younger persons being at greater risk of making insurance claims and/or being treated for WAD compared to those in older age groups. Risk estimates have varied from 20% (19) to a fourfold increase for the youngest age group of subjects between 18-23 years of age compared to those fifty and older (16). As mentioned, this association may be explained, in part, by younger persons being at greater risk of making insurance claims and/or being treated for WAD (7). It could be postulated that younger individuals may have more uncertainty with regards to prognosis of WAD, less experience with dealing with generalized bodily aches and pains that are more common with older age,* or have higher expectations of medical interventions to alleviate symptoms than older individuals (7).

---

*Degenerative changes in the cervical spine are strongly associated with increasing age. However, degenerative changes are not necessarily associated with neck pain; such changes are common in both those with and those without neck pain (139). Furthermore, both the fact that younger age groups are more likely to seek health care or file a claim for WAD (7) and that the frequency of neck pain peaks in middle age rather than in older ages (8) argues against the view that degenerative changes are an important and common cause of neck pain.

These reasons could explain why time to claim closure was longer in the above mentioned studies.

The prevailing type of insurance system may also be important given findings from one natural experiment demonstrating the elimination of insurance payments to a "no fault" system, where payment for pain and suffering is not available, reduced insurance claims by 28% as well as the amount of time that individuals remained on an injury claim (16). Countries that do not have a tort insurance system also show shorter duration of symptoms that are attributed to the collision (20,21). Some authors have suggested that prevailing thoughts on expectations of disability following motor vehicle injury are influenced by culture and may explain some of the variation that has been observed between regions for symptom duration (22).

Evidence is available for the efficacy of whiplash protection devices aimed at limiting passenger head extension in rear-end collision, with one study reporting that female drivers (but not males) had a lower rate of WAD if cars were equipped with "good-rated" head restraint positions compared to "poor-rated" restraints (23). The same author found that devices such as an active head-rest were associated with a 43% reduction in WAD symptoms after rear-end collisions, with the effect being greater in females (24).

1.4 Incidence and Prevalence of Neck Pain in Workers

Incidence estimates for neck pain in the general working population in European countries and in North America are not identical, but share some similarities. Studies of workers in France and the Netherlands show persistent neck pain of 9.4% (25) and 5.7% (26) respectively for 5 and 1-year incidence rates, while in Sweden estimates of 6% for men, and 8.1% for women were noted for persistent neck pain (27). It appears that across the literature specific incidence estimates vary by the type of job examined. Cote et al. describe office and computer workers as having the highest incidence of neck disorders, with high rates also observed in health care workers, including dentists, nurses and dental hygienists (28).

Point prevalence and one week prevalence estimates range from 4.8% to 50.8%, with differences being observed among countries where the research took place, among occupations, and also due to differing definitions of what constituted neck pain (29,30). Annual prevalence estimates of neck pain in workers sampled from the general population were noted to range from 27.1% in Norway, to 33.7% in the U.K. and to 47.8% in Quebec, Canada (28). Similar to variations in incidence of neck pain, Cote et al. found that neck pain prevalence varied across occupations, with variations being observed among different types of health care workers, and across industries such as office work.

1.4.1 Risk Factors for Neck Pain Among Workers

In their best evidence synthesis, Cote et al. reported a variety of modifiable and non-modifiable risk factors for development of neck pain in workers (28). When age was studied as a risk factor, the preponderance of evidence indicates that the incidence of neck pain increases with age with the peak effect being observed in the fourth and fifth decades of life, and remaining stable thereafter. There was also evidence to suggest that women experience more neck pain (28). Ethnicity and country of origin also lead to variation between the incidence estimates of neck pain, but findings from both of these studies were reported as being preliminary (27,31). A history of musculoskeletal pain or tension in the neck, lower back, or upper extremities increases the risk of neck pain in the preponderance of examined studies. Other factors identified as risk factors were: history of headaches, obesity (with BMI >30kg/m^2), depressive/emotional symptoms, mental stress, and personality type ('type A" personalities having an increased risk).

Preliminary evidence showed modifiable factors, such as type/class of occupation, is associated with the risk of neck pain or neck pain causing disability; one study showed manual workers having a greater incidence than executives or professionals (considered to be more sedentary level work) (27). Lower or moderate rating of physical capacity of neck and shoulder musculature was associated with an increased risk of neck pain compared to those with higher ratings for physical capacity (32). Other aspects of occupation such as high perception of psychological job strain, low coworker support, low job security, prolonged work in a sedentary position, repetitive and precision work, sustained forward flexion neck posture, awkward postures, inadequate keyboard and mouse position, use of a telephone shoulder rest, a lack of chair armrests, position of the elbow and shoulder while working at the computer, and head posture while working at the computer were all associated with increased risk for neck pain in workers (28).

In their systematic review, Cote et al. noted that neck pain in workers was most often non-traumatic in nature and that the etiology is multi-faceted. It would appear that the combination of several risk factors (individual, work-related and cultural variables) is a necessary prerequisite for neck pain rather than with the presence of any single risk factor (28).

1.5 Course and Prognosis of Neck Pain

1.5.1 Importance of Course and Prognosis

Knowledge of the clinical course of neck pain provides valuable information to both clinicians and patients in shaping expectations of what is most likely to follow after a neck pain episode. Prognostic information also allows comparison against possible interventions to see whether the usual course of clinical recovery changes. Evaluation for the course and prognosis of neck pain requires study designs which follow individuals who have neck pain over a period of time. Those with neck pain at the start of the study are tracked over time to identify what factors and characteristics distinguish those people who recover from their neck pain from those who do not (33). In this way, a correct temporal sequence is identified (the exposure of having neck pain preceding the outcome of recovering or not recovering) allowing for associations to be correctly identified when they are present. By comparing characteristics such as demographic, health related, psychosocial and other variables between those who recover and do not recover over a period of time, associations can be identified and then used to predict the course of neck pain.

1.5.2 Course and Prognosis of Neck Pain in the General Population

In their best evidence synthesis of the literature on course and prognosis of neck pain in the general population, Carroll et al. were able to identify prognostic factors for recovery from neck pain (33). Information presented was done by utilizing relevance screening and literature quality assessment reviews to inform the current state of the literature on course and prognosis. The authors reported that most of the evidence indicates between 50-75% of people in the general population who experience neck pain at some initial point will report neck pain 1 to 5 years later (33). In children, approximately 50% with some initial neck pain that occurs at least once a week report similar pain or intensity a year later (34,35).

Evaluation of demographic and socioeconomic factors revealed that studies with the best methodologic rigor did not show any differences by gender in the course of recovery from neck pain (36-38). These were cohort studies that explicitly identify and control for confounding allowing one to confirm/refute the independent relationship between a factor and outcome. Studies that looked at age as a prognostic factor showed consistent evidence that younger age is predictive of better recovery from neck pain compared to older age (33).

Evaluation of prior health, prior pain and co-morbidities demonstrated a modest impact with odds ratios of two or less in most studies (33). Factors such as initial pain intensity, duration, and pain-related difficulties in performing activities; prior neck/shoulder symptoms, prior neck injury; co-morbid low back pain; and self-perceived poor general health all predicted the presence and/or greater intensity of neck pain at follow-up (36,39).

One study examined workplace factors using employment status (employed versus not employed) as a variable which showed those who were not working were 60% more likely to report the same frequency of pain one year later (36). Other factors such as job satisfaction and physical job demands were not reported as significant by the study authors, but in these studies neck pain was pre-existing, therefore the temporal sequence could not be elucidated causing uncertainty in understanding the direction of this relationship (33).

The preponderance of evidence suggests that psychological and social factors show a stronger association than other prognostic factors for outcomes from neck pain. Factors such as vitality, greater social support, being more optimistic, and having less of a need to be social predicted greater reduction in neck pain intensity, and showed generally stronger associations (with odds ratios between two and six) than for other factors that were examined by the Neck Pain Task Force (33).

The authors of the best evidence synthesis concluded that neck pain in the general population is persistent and/or recurrent (33). One study examined the course of persistent neck pain and showed that in those who reported mild or intense neck pain without disability, 10% went on to have disabling neck pain in the subsequent follow up periods (40). Approximately 20% of the study participants reported recovery followed by worsening, and 40% experienced persistent levels of neck pain. The findings from this study seem to support the idea that complete resolution of neck pain in the general population does not occur in the majority of cases.

1.5.3 Course and Prognosis of Neck Pain in WAD

Again, with reference to the NPTF's best evidence synthesis of the literature on course and prognosis of neck pain following vehicle collision, Carroll et al. were able to describe the strength of association of various prognostic factors on recovery from neck pain, and course of recovery following vehicle collision through an exhaustive review of the relevant literature. The preponderance of evidence suggests that the course of recovery of WAD is prolonged, with approximately 50% of those affected reporting neck pain symptoms one year after the event (41). Previous sections of this dissertation have reported that the baseline prevalence of neck pain in the general population to be between 20-40% (one month prevalence estimates) (41). Therefore, in some cases, the pain and symptoms reported at one year following a vehicle collision may not be related to the collision, rather the underlying level of neck pain experienced prior to the collision.

Studies have demonstrated that high proportions of individuals affected with WAD experience prolonged symptoms after the collision. Following vehicle collision, of those who had initially reported to emergency departments with WAD symptoms, 60% still reported symptoms at six months (42-44). In two Canadian studies of insurance claimants, 50% of individuals had actually closed their claim six months post-collision (16), but 34% did not report being "all better," or showing "quite a bit of improvement" of their symptoms (used as an index for recovery in the study) (45). At one year, two studies demonstrated that 44% of those who initially attended an emergency department, and 66% of those who made a traffic injury claim still experience symptoms. However, when questioned whether pain occurred daily or whether the collision caused significant health impairment, these numbers dropped to 12% and 9% of subjects respectively (46,47). When WAD grade was taken into consideration, presence of neurological signs (indicating WAD Grade III under the QTF classification) increased the proportion of those who were symptomatic at one year to 90% (48).

Long-term follow up studies suggest WAD symptoms persist or recur, although the available studies cannot definitively link the reported long-term symptoms to the collision (41). One study which included a follow-up at 30 months found that, of those who initially reported to an emergency department after vehicle collision, 58% still attributed symptoms to their injury event (49). These findings suggest that individual impairment/disability perceptions from the experience of a vehicle collision are influential for reported symptoms three years on. It may be that some individuals, societies or cultures may have a pre-conceived notion of disability due to motor vehicle collisions that make them more likely to attribute subsequent symptoms to the event.

Findings from two other studies of prognosis and course of recovery in Greece and Lithuania showed rapid recovery rates post vehicle collision. Ninety percent of subjects in Greece recovered by one month, and 99% by six months (20); the median duration of neck pain in Lithuania was three days with a maximum length of 17 days (21). These observed cross-cultural differences may prove to be an important avenue of future research to look at whether perceptions of disability impact recovery from vehicle collisions. However, it should be noted that a third study reporting rapid recovery in WAD was carried out in Sweden, and there may be reasons other than differences in culture for the reported discrepancy in recovery patterns (50).

Prognostic factors that were evaluated by the NPTF following vehicle collision included demographic/socioeconomic factors, prior health/pain or co-morbidities, collision factors, initial symptoms, psychological, social and societal factors (41). Findings regarding age and gender as a prognostic factor on recovery from WAD varied. However, even in those studies which identified gender as prognostic, the effects were modest with, at most, a two fold increase in the likelihood of poorer outcome, suggesting that it does not play a major role in the outcome in question (41). The authors also noted that three studies found no association between gender and outcome after adjusting for psychological factors. Gender dissimilarities in psychological functioning might provide an explanation of the presence of associations found in other studies that did not adjust for psychological factors.

With regards to age, eight distinct cohort studies were evaluated with five showing no association between age and outcome after WAD. Of the other three cohorts, modest effect sizes were noted with older age predicting slower recovery or slower insurance claim closure (41).

As noted with the demographic factors of age and gender, evaluation of prior health, prior pain and co-morbidities showed varied results. According to two studies, prior neck pain was a strong predictor of neck pain at one year post-collision, and predicted interference of work or leisure at 16 months (51,52). Two other studies indicated that prior health and prior pain did not predict poorer outcome (16,53). It should be noted that all studies examining this issue used post-injury self-report to determine prior neck pain and prior health, so measurement bias may have been present in one of both of these studies.

Collision-related factors that were evaluated, such as the person's position in the vehicle, his or her awareness of the impending collision, use or type of headrest, use or type of seat belt, direction of the collision, whether the person's head was turned or facing forward, and self reported speed differential between vehicle or vehicles involved in the collision, failed to show a significant prognostic relationship to WAD recovery (41). One study did demonstrate that persons injured in vehicles possessing a tow bar (an apparatus which equips vehicles for towing trailers or other objects) had a poorer prognosis over the long-term, with modest effect size (54).

Higher WAD grade, as outlined by the Quebec Task Force, showed consistent evidence of recovering more slowly in the few studies examining this prognostic factor. Three years following vehicle collision, those with Grade III WAD had over three times greater odds of reporting significant changes in health compared to those with Grade I WAD (55). Even when WAD was graded according to self-report versus a clinical examination, increased WAD grade predicted higher pain intensity and disability two years following the collision (56). When indices of severity other than the Quebec Task Force grading were used (e.g., initial pain intensity, severity of initial symptoms), similar findings were noted, with consistent evidence that greater initial self-reported symptom severity was associated with slower or less complete recovery (16,46,53,56,57).

Psychological factors that were noted to be prognostic in recovery from WAD included passive coping later in the recovery period, depressive symptomatology, feelings of helplessness in controlling the consequences of pain, fear of movement, catastrophizing, and initial post injury anxiety (41). One study that evaluated coping strategies at six weeks post injury following vehicle collision noted that passive coping predicted a 55% slower recovery (58). Also, the same study found that in the presence of depressive symptomatology, using a passive coping strategy slowed recovery by 75% than in those who employed non-passive coping strategies and that depressed mood itself predicted 32% slower recovery from WAD. Feelings of helplessness in controlling consequences of pain made individuals 2.5 times more likely to report that pain two years after injury would be higher than in those who did not feel helpless, and also doubled the odds that individuals would report high levels of disability (56).

Social factors such as the prevailing compensation and legal system were prognostic in recovery from WAD. One study found that claim closure took twice as long when insurance claims were made under a tort insurance system versus a no fault system (16). In this study, under the tort system individuals injured in a vehicle collision were entitled to limited benefits and could sue the driver of the collision for additional expenses where under the no-fault system, individuals are not able to sue for pain and suffering. The same study found that seeking legal advice early on following the collision resulted in delayed claim closure under both the tort and no fault system (HRR = 0.60), meaning that individuals closed claims 40% more slowly compared to those who did not involve a lawyer. Despite the fact that this study used claim closure (rather than pain, disability, symptom recovery, etc.) as an outcome, claim closure was highly associated with lower pain, greater physical functioning and better emotional health (45).

Health behaviours and interventions were also reviewed by the NPTF. One study of traffic-related WAD demonstrated that those with more frequent health care visits, those seeing chiropractors, and those who consulted specialists or chiropractors and general practitioners had up to 40% slower claim closure (16,59,60). These findings were corroborated by another study of insurance claimants where a network of community-based rehabilitation programs did not enhance patients' recovery, instead prolonging recovery by 30-50% compared to those who did not attend (45).

The authors concluded that the course of recovery in WAD shows remarkable similarity to the course of recovery of neck pain in the general population as well as in workers, all of which demonstrate a persistent and recurrent course (41). Also, as with the general and worker populations, determinants of recovery from WAD appear to be multi-factorial.

1.5.3 Course and Prognosis of Neck Pain in Workers

With reference to their best evidence synthesis, the Neck Pain Task Force conducted a best evidence synthesis of the literature on course and prognosis of neck pain in workers and were able to describe the strength of association of risk factors on recovery from neck pain in workers and their course of recovery through an exhaustive review of the relevant literature. The preponderance of evidence suggests that the course of recovery of workers, as with the general population and in a WAD population, is prolonged, with approximately 50% of those affected reporting neck pain symptoms one year later (61). Because reported neck pain was assessed at discrete follow-up points, the authors were not able to distinguish whether neck pain was continuous or whether it was remitting/relapsing for the studies included in the review. In a cohort of Canadian workers, authors did find that insurance claims were frequently recurrent, with 38.5% of claimants having at least one additional compensated work absence due to neck pain in the three years subsequent to the index claim (62,63). In another cohort of workers defined as having chronic pain (long-standing pain with functional limitation), 65% of men and 53% of women had some decrease in neck pain severity 5 years later so that they no longer met the definition of chronic neck pain used at the study outset (25).

Evaluation of prognostic factors revealed that, in general populations of workers, women were slightly more likely to report persistent or recurrent neck pain compared with men (25), but when studying the role of gender in specific jobs such as nursing home workers and persons in the forestry industry, gender was not a prognostic factor for recovery

(64,65). Interestingly, despite older age increasing the *risk* of new neck pain in workers (28), older age does not appear to be a *prognostic* factor for recovery (64-66).

Physical job-demand characteristics and ergonomic factors studied had little or no prognostic value. Factors which showed no relationship to recurrent/persistent pain among assembly line workers were: type of sewing machine used, workload, pace, ergonomic adjustments, work type, employment duration, hours at work, strenuousness of work, work posture, physical load, heavy lifting, and overhead work (64,66-68). For work related factors, only small associations were noted between high job demands and (for women) repetitive work and recurrent/persistent neck pain at follow up (25). Other factors that were prognostic for poorer outcome were previous musculoskeletal pain, prior sick leave (25,64-66,68), and occupational type (blue versus white collar workers) (65,69,70).

Psychological factors were, in most cases, not prognostic of neck pain recovery in workers. Having little self-perceived influence over one's own work situation was noted to show a relationship, but this relationship was modest. It should be noted that some of the psychological factors with the strongest associations with recovery in the general population and in those with WAD have not been investigated in populations of workers. With respect to health behaviours, self-reported exercise predicted a better outcome (25,68) with men who engaged in sporting activities being 50% more likely to experience an improvement in chronic neck pain (25).

The evidence in workers suggests that prognosis for neck pain is determined by a combination of factors, of which few are readily modifiable (61). The authors concluded that the course of recovery in workers shows remarkable similarity to the course of recovery of neck pain in the general population as well as in a WAD population, all of which demonstrate a persistent and recurrent course (41).

Chapter 2: Review of the Expectations Literature

2.0 Recovery Expectation

In recent years, a shift has occurred from using the traditional medical model for treatment and management of various medical disorders, such as WAD, to one that approaches such problems from a biopsychosocial viewpoint. This approach acknowledges a host of elements as being influential in overall health such as the environment, society, relationships and psychological factors. Interactions between these elements can have bearing on individual health. This change in thinking about health impacts has provided impetus for medical researchers to examine and build on works from the psychology and sociology literature, and look at how one facet of this literature, an individuals' expectation, influences important health outcomes. While this area of research has provided interesting results and encouraged further examination building on the biopsychosocial approach, a variety of methods, definitions, and frameworks for expectation make it difficult for readers to develop a good implicit understanding of expectation.

2.1. What Does 'Expectation' Mean?

Using the term expectation in a literature search strategy demonstrates that those who write about the concept of expectation do not use a uniform definition. This may be due to the lack of an agreed upon theoretical framework for how expectation actually influences individual health outcomes. The most cited theoretical framework for expectancy looks at Bandura's concept of self-efficacy (71). This may be a problematic way to view expectation as self-efficacy relates to individual behaviors in terms of a specific situation to achieve a goal under specific conditions (72). For example, an individual may have high self-efficacy to be able to lift a weighted crate, simulating a specific job task of her work, but this does not necessarily mean that she has high expectation to return to work if she can perform this task while off work with an injury. In this instance, the ability to perform a specific behavior (lifting a weighted crate) does not necessarily relate to an actual outcome (e.g. return to work), but could be a component of the overall outcome.

Herein lies the difference between self-efficacy and expectation. Expectation relates to a specific outcome, such as the ability to return to work following a work-related injury rather than the various steps/behaviors in achieving the outcome. The outcome 'expectancy' is made up of the individual self-efficacy behaviors (lifting a crate, being able to stand at a counter for 8 hours, etc). Maddux suggests that, "researchers should not call an expectancy for attaining an outcome a self-efficacy expectancy if they also call an expectancy for performing a behavior a self-efficacy expectancy" (72).

It appears from review of the expectations literature authors generally equate the term self-efficacy with outcome expectation as though they were synonymous. This has the unfortunate consequence of leaving readers with a sense of confusion of whether the author is correctly identifying their intentional construct. Also, the reader can have difficulty deciphering among the various terms that authors have devised to refer to expectation (prediction, belief, forethought, functional self-efficacy, expectancy). A clear, specific definition of expectation allows a reader to carefully examine the intentions of research projects, echoes calls from researchers to develop a systematic approach to terminology, and assists to avoid confusion to related constructs (73). Moreover, the conceptual frameworks and functions of outcome expectancies and self-efficacy expectancies are not equivalent (74), reinforcing a need to provide a clear identification of which construct is being studied within a research paper. This point will be further examined in later sections of this chapter.

2.2. Why Study Expectation?

A recent systematic review of the expectation literature has demonstrated that an individual's outcome expectation across a variety of medical conditions is moderately associated to important health outcomes (75). Mondloch et al. searched the literature between 1966 – 1998 and found that positive expectation was associated with better health outcomes for conditions such as low back pain, myocardial infarction, and obesity. They noted that controlling for confounders including biologic, psychological, and social variables usually had little effect on the strength of the relation between expectations and the outcome, indicating an independent influence of recovery expectations on these health outcomes. The authors also suggested that little differentiation in effect size of expectation on health outcomes by type of condition was apparent, although smaller effect sizes tended to be more common for psychological conditions (e.g., social phobia), and larger effect sizes for medical conditions (e.g., obesity) with the former potentially being an artifact of measurement precision.

A search strategy was employed to locate research papers from 1998 to 2008 using the same steps outlined by Mondloch et al. to compare to the previous systematic review. Papers published since this systematic review have continued to show a trend that positive treatment and outcome expectation were correlated with actual outcomes (73,76-79). As such, expectation would be a particularly suitable factor to study in relation to health outcomes as it can be assessed relatively easily with appropriately formed questions regarding the outcome of interest and can be used as a prognostic tool which may reveal those individuals requiring assistance in achieving outcomes (i.e. those who have poor or negative expectation).

2.3 How Do Expectations Work?

2.3.1 Interventional Studies

The literature regarding outcome expectation tends to focus on asking study participants what expectation they have for an outcome with or without an intervention (procedure, treatment). In a recent paper, Goossens et al. identified that treatment expectancy is a much stronger predictor of treatment outcome compared to treatment credibility, which refers to how believable and logical the treatment was to the patient (76,80,81). Studies identify that the "placebo effect" may be influential in the examination of expectation with an intervention. Those who expect to benefit can have improved outcomes solely because they *expect* that a benefit will be due to the intervention and not from the actual effects of the intervention itself. Intervention expectation has been found to be partly responsible for "non-specific" effects of treatment (82,83); as suggested by findings from a randomized control trial of acupuncture and massage for low back pain, showing that those who had a preference for one treatment modality over the other had an almost 20% improvement in function after controlling for baseline characteristics compared to those who received their non-preferred treatment (78). The authors concluded that patient expectation of treatment may influence clinical outcome independently of the treatment itself and postulated that the "success" of some therapies may be attributable to these "non-specific" effects of expectation. Several studies involving other interventions and conditions have shown similar findings (84-86). The authors suggested that future research should look at whether expectations change over time, or in response to interactions with providers of interventions (i.e. attitudes, feelings and perceptions towards health care providers), and that these possibilities should also be considered in discussions of expectations. The evidence provided in these studies demonstrate that expectations have an independent relationship on outcomes, but do not exclude the possibility that expectations are mediating versus causal factors. Expectations could theoretically be part of a complex pathway between treatment exposure and an outcome whereby a treatment has some influence on expectation, which in turn has a relationship with the outcome.

A framework that assists in explaining these non-specific intervention effects is the response expectancy theory, which has roots in the psychological and sociological literature (87). A response expectancy, "is an expectancy for a non-volitional response, such as a subjective experience and its physiological sequelae" (72). This may include expecting responses such as a particular emotion. Maddux reasons that response expectancies are concerned with an individual's belief about their own reaction to an event, for example an intervention, and are not under direct control of the individual. Response expectancies are self-confirming meaning that people tend to experience, in a non-volitional way, what they expect they would otherwise experience. Therefore, an individual who might expect anxiety before attending a dental appointment, in the absence of a history of anxiety, would likely experience this upon seeing the dentist in the examination room.

The response expectancy theory has 3 basic assumptions: 1) expectancies for non-volitional outcomes are sufficient to cause the expected outcome; 2) response expectancy effects are not mediated by other psychological variables; and 3) effects of response expectancies are self-confirming and apparently automatic (87). Taking these assumptions into account, a theory for postulating why interventions, such as procedures or treatments, may exert a beneficial effect on individuals regardless of the actual efficacy/effectiveness can be tested, and also be used to modify the above mentioned framework. Volitional responses, such as return to work or recovery, may also be part of response expectancy, and psychological variables such as depression may be a mediator between the expectancy and outcome. Also, it may be that responses are not automatic as the third point in Kirsch's theory may suggest and could be amenable to treatment (modifying expectations) or conditioning. Regardless of whether the assumptions hold in all situations, beginning with this theory allows for a more systematic examination of how intervention expectancies may work, and any discrepancies that test this theory can be used to modify it.

In discussions within the expectation literature, five mechanisms were identified by which placebo may influence outcomes: triggering of a physiologic response, acting to help motivate patients to achieve better outcomes, conditioning the patient psychologically to observe certain types of symptoms and ignore others, changing the understanding of the disease, or acting in concert with anxiety to heighten or reduce symptoms (88). While viewpoints provided by Kirsch include important non-volitional factors with regard to non-specific effects of treatment, the mechanisms outlined by Flood et al., also seem to point to factors that the individual can impact through volitional behaviors (i.e. reflection on symptoms to increase understanding/mediate impact on living, choosing to ignore some symptoms and not others). It would seem reasonable that that for any lasting placebo effect to occur, some aspect of volitional behaviors, such as reflection, learning, and goal-setting would be necessary. In fact, Flood et al. were able to show strong evidence that positive expectations continued to predict that patients would feel better at three, six, and 12 months despite not having a significant influence on clinically relevant outcomes (such as pain, sleeping difficulties, etc.). They postulated that researchers may have previously attributed too much influence of the placebo effect suggesting that patients distort their perceptions of post-operative symptoms. Instead they may be better able to distort their memory of pre-surgical symptoms, leading them to believe they have improved, but not causing them to report their current status incorrectly (88). These apparently volitional behaviors would appear to have significant impact of influencing expectation.

2.3.2 Non-interventional Studies

For individuals asked to assess a relevant outcome without specific attention to the mediating effects of an intervention, similar results have been shown with those who have more positive expectations also having better outcomes compared to those with negative expectation (77,79,89,90). The difference between these research questions and those regarding intervention is that there is no "placebo effect" that could be attributed to the results demonstrated from these studies; individuals would be assessing outcome based on factors other than their belief in an intervention. An additional framework is required to account for the results of these types of studies.

There have been various theories postulated within the literature with specific theories being tied to specific outcomes such as return to work (Readiness for Return-to-Work Model) (91), patient assessed recovery (92), satisfaction (93) and self-efficacy (71). Janzen et al. recently pointed out the lack of any theory driven conceptual model that described the role of health expectations in health outcomes (94). As a result, they have offered their own conceptual model of health recovery expectation, based on a social-cognitive theoretical orientation (72) that they argue has relevance in the real world. This was deemed important since health care research requires an understanding of the process through which expectation is developed, as opposed to more abstract concepts which characterize this field of study. The Janzen et al. model views expectancies as "stored associations between behaviors and resulting consequences, which then guide subsequent behaviors" (95). As a result, expectation can form behavior, aid in recognition, and influence understanding (96).

Another important element that is assumed for this model is that expectations are socially and culturally contingent, are created by one's understanding of the world, and formed in relation to the social and cultural contexts within which one is situated. In this regard, expectations are unique to individuals and take time to develop, as the process is both longitudinal and cyclical (94). Expectations can develop by personal experience, such as having previously observed the time it takes for a skin laceration to heal in determining how long healing should take for a paper cut, through suggestion of others/vicarious learning, or by observing others. Janzen et al. suggest that each of these factors may contribute to the strength of an expectation over time. If an individual can successfully use an associated expectation in a new/future situation, a certain strength and resistance to change should result. This learning cycle can assist in formation of expectation regardless of the context of the situation.

In keeping with the biopsychosocial model of health, important factors are included in the conceptual model outlined by Janzen et al. The theory acknowledges that contextual factors are important in the relationship of developing a health related expectation such as cultural and social interactions. The environment in which they are formed is unique, individual and subject to change should the context change. Cognitive processes are crucial in solidifying these expectations along with an individuals' experience. There can be further modification of the expectation to fit new situations should this be necessary. While this theory is likely not complete in its scope, modifying, using and building upon this framework, is a good starting point for researchers interested in expectation.

Discussion regarding how recovery expectations are formulated and a thorough discussion of this model will follow in subsequent sections of this chapter.

2.4 What Factors Influence Expectation?

While important theorized factors have been listed above regarding culture, environment, and context, the literature has provided some direction for how and who may influence an individuals' expectations. The question of what factors are influential in formation of expectation has not necessarily been outlined "*a priori*" in research studies. Instead, there have been secondary analyses in some papers that have provided preliminary information regarding important factors.

Studies examining demographic information for those expecting to return to work after an episode of lower back pain identified marital status being associated with positive recovery expectation after controlling for differences in age, job tenure and income level. Those who were single were more likely to have positive return to work expectations (73). Other demographic variables such as age, gender, education, income, and ethnicity were not generally found to be associated with a more positive expectation to return to work, although studies have also pointed out that for total knee arthroplasty patients, increased age was associated with worse surgical expectations (97). Another study of those with chronic lower back pain and fibromyalgia showed that for individuals in a treatment program, those with reduced fear of movement or re-injury, those less likely to be receiving compensation, and those using active coping strategies had a more positive pre-treatment expectation for success of treatment (76). In this study, gender, pain duration, pain control, catastrophizing, depression, and percentage of compensation failed to remain in a pre-expectancy predictive model for positive expectation. The importance of more distal factors compared to demographic data was demonstrated within this study such as function, economic factors, and some psychological factors. A recently published randomized trial to modify patients' preoperative expectations of hip and knee arthroplasties showed that lower expectations were associated with worse SF-36 functional score at baseline, having greater disease severity and greater surgical expectation pre-intervention (97). Reduced function at baseline, having better general health, or seeking healthcare providers for the first time were associated with higher general expectations for a group of patients with acute lower back pain (98).

Of note is the lack of significance that pain has in this study in formation of positive expectation (98). Pain may have a role in the formation of expectancies via its impact on function, which in turn influences motivation to perform tasks (99). Complete symptom resolution might not be necessary for an individual to report a sense of recovery, or for reporting being "improved" due to a treatment (79,92). Previous experience, vicarious learning, personality, family and culture are influential factors that shape expectancies (100), and may cause an individual to think about pain in terms of readjustment of life to accommodate for pain, or redefinition by accommodating the pain as part of his/her life (92). In both readjustment and redefinition, the focus is working an individuals' life around their disorder/pain and, as such, pain may not, on its own, be enough of a factor to influence expectation. Individuals may combine the experience of pain within larger life contexts such as role limitations at work, reduced function for activities of daily living, or reduced participation in leisure pursuits. Impact of pain within these contexts might provide insight to how much expectation should be influential. Thinking of pain outside of these contexts might not provide enough significance to be an associated factor for expectation.

Other people have also been shown to play a role in influencing a person's expectations. Male cardiac patients who had undergone coronary bypass surgery were shown to have less anxiety, higher levels of self-efficacy expectation and self-reported activity for general activities such as walking and stair climbing when they were provided with peer support from volunteers who had recovered from cardiac surgery (101). Vicarious experience was felt to be of benefit in producing positive expectations and positive outcome in recently operated males. Also, patients undergoing joint arthroplasty were noted to benefit from a group information session and were influenced by other patients and staff as they proceeded through the routine preoperative process (97). The confidence of a spouse has also been shown to be predictive of survival following heart failure (102). Those with lower back pain who were married/partnered had higher expectations for recovery (98). This research also suggested that for conditions that require or directly involve other people, that require negotiation, and that involve ongoing social relationships, self-efficacy theory would be less applicable. The social interactions of caregivers or others clearly have important effects on expectations and on recovery. Social support from friends, partners, and family was found to confer greater ability to cope and increase feelings of self-efficacy following abortion in young women (103). While self-efficacy is not necessarily an identical construct to expectation, it can be thought of as a component towards the overall goal of an outcome. This association has been demonstrated in cardiac populations, and significant relationships between the two (self-efficacy and expectations) exist (104). Based on findings from these studies of the effects of relationships, conceptual frameworks describing the role of expectations in health outcomes need to take into account the influences of other individuals.

2.5 Expectation Formulation

2.5.1 The Importance of Perspective for Outcome Evaluation

Research has demonstrated the significant impact of an individuals' expectation as an important factor in the recovery process across a variety of medical conditions including obesity and myocardial infarction (75). The lack of a theoretical framework that explains how individuals formulate a recovery expectation has contributed to a diverse array of approaches and definitions, and lack of consistency in the expectation literature (93). This has had the unfortunate effect of diluting the quality and confusing the direction in this research. Examination of expectations from a variety of disciplines including psychology, sociology, economics and health sciences, has made some headway in our understanding of this large, complex puzzle, and such approaches have been incorporated in conceptual models of musculoskeletal injury, and health related quality of life (105-107).

Conceptual models are necessary for guiding research; choosing timing for interventions when factors are amenable to treatment; facilitating in achieving important outcomes; facilitating with measurement development; study design; and facilitation of communication between professionals and assisting research projects between disciplines (91). Where a gap appears to lie is in the integration of these various pieces and methods from different disciplines into a unifying theory that looks at all of these diverse, yet complimentary viewpoints. The biopsychosocial model proposed by Engel incorporates varying perspectives, which are critical for the examination of important health related factors such as individuals' expectation for recovery (108). The development of a unifying theory to explain these would therefore become useful for clinicians and researchers alike and could benefit those forming health expectations.

Outcome expectancy cannot be understood without an understanding of "health recovery". However, what individuals identify as "recovery" has also not been well defined. Individuals ascribe different meanings to this term depending on their experience with the particular disorder in question. A qualitative research study by Beaton et al. looking at upper extremity musculoskeletal disorders identified three main states which injured workers defined as 'recovery' (92). The first state was coined 'resolution' and included the reduction in symptoms of a certain magnitude, across a certain threshold making symptoms easier to ignore, or a threshold that allowed adequate coping with the pain. For resolution, pain intensity/frequency, or the duration between episodes was used as a measure to define being better by study participants and these were differentiated between changes that were not significant to each individual (i.e. not just any reduction in frequency, intensity of pain was considered significant). Beaton et al. called a second state 'readjustment', meaning modifications to activities of daily living or lifestyle to assist in working around or avoiding aggravating the disorder still present.

This includes using assistive devices such as bracing, changing workstation set-up (ergonomic interventions), or modifying work tasks in order to reduce pain. The third recovery state is one of ‘redefinition’ where there is adaptation in individual lives, not by changing their activities in order to accommodate and avoid pain but by accommodating the pain as part of their lives. In this scenario the authors describe that, “people were moving on with life despite, not without, their pain. They shared that their pain had shifted from the dominant part of life to a less prominent part.” Within this stage, there appears to be some mastery of living with the disorder and its consequences rather than control of it. This state signifies a change in the definition of what constitutes quality of life for an individual.

This work demonstrates what individuals conceive as being recovered is not uniform even when there is consistency between diagnoses or exposures such as workplace factors, job type, duties, etc. Recovery for those with whiplash associated disorder, for example, did not require for baseline levels of pre-collision general health to be reached before the individual identified themselves as being recovered (79), and readjustment or redefinition may often play a role for a self perceived sense of recovery. Contextual factors that are traditionally not evaluated by medical researchers, such as subjective meaning of the term recovery, becomes an important example of the array for responses of a relatively simple question, but offers a variety of different meanings depending on the life situation of the individual. This oversight can have significant impact on outcomes where recovery can mean not having complete abolishment of symptoms for some, while it becomes a necessary pre-requisite for others. The authors concluded that, "illness behaviors can only be understood within the framework of past experience, personality, family and cultural standards, and current interpersonal interactions" (92).

Beliefs regarding recovery also provide a framework to deal with its consequences such as processing information about pain, activity limitations, the nature of the illness, and future course (109). This information will inevitably be useful for the individual to make sense of what is going on and influence decisions regarding recovery expectation. These beliefs will be the product of experience, learning and culture (110).

2.5.2 Influences of Biopsychosocial Factors on Recovery Expectation

The biopsychosocial framework provides a guideline to examining expectation formulation. Extrapolating from this theory, we would consider that influences would come from social interactions (external relationships or interactions with other people, whether individually, in a group, or collectively with society), and from the individual (the beliefs, emotions that the person has himself or herself) (110). Contributions from the fields of psychology, sociology, and health sciences have provided evidence for these influences, and a further examination of these factors is important in understanding variables within a theoretical framework for recovery expectation formulation by understanding how these factors influence behavior and cognitive processing.

2.5.3 The Influence of Relationships and Socialization on Behaviour and Cognition

Relationships constitute social interactions. Human beings are social creatures and will gravitate towards others and to larger groups, providing individuals the chance to develop relationships and construct behaviors that reflect the values/norms of groups to which they belong through effects on cognition. These behaviors become the basis for forming personality and guide social interactions on all levels from the "micro world" of the family to larger "macro world" such as institutions like education or government (111). As such, socialization becomes a method by which individuals can interact and identify with each other and a method to experiment, refine and change behaviors. The cumulative effect of these behaviors is the development of personality.

Socialization occurs over the life course through communication (verbal and non-verbal), feedback and conforming behaviours (112). It is important in the process of molding or refining behavior and personality. Socialization varies according to different contexts or situations that require approaches other than socialization (113). The life course provides innumerable opportunities for this to occur. With each new situation encountered, feedback is provided in order to guide socialization. Cues provided earlier in life become more influential than later on, when ideas/behaviors become cognitively ingrained. No two situations are ever identical, and therefore behaviors require some modification within each specific context. Individuals obtain cues from all of these situations to incorporate their meanings into appropriate behaviors and also to shape thoughts, feelings and ideas regarding these situations. The pressures of society, whether real or imagined, are present and guide conformity of our attitudes, beliefs and behaviors in order to relieve us of requirements for making an innumerable amount of decisions in a day that would otherwise become necessary. Social norms such as driving on the correct side of the road as everyone else, or observing laws in place to improve personal safety are not questioned on a daily basis because we accept laws and personal safety as important values shared by our society. The social pressure of conformity unburdens individuals from deciding who has the right of way at a red light, where it is safe for pedestrians to cross a road, and whether to yield for oncoming traffic when merging on the highway. This allows the individual to focus their attention on being an alert driver instead. Conformity affects social situations, and allows a method by which people interact with each other, provides a template for how shared values are approached and which behaviors are appropriate for various situations.

Social learning provides an opportunity for experiences to develop. Past experience is reflected upon and cognitively integrated into a growing, coherent view of the individual's reality (113). These will then be remembered for subsequent events as a way to effectively manage them in these future instances. The same holds true for health related behavior such as expectations. An individual does not form an expectation for a situation when there is no previous reference from which a prediction can be drawn; there needs to be a previous context from which to make an assumption. A large part of this formulation comes from knowledge obtained from others through the various relationships that individuals have, beginning early in life.

2.5.4 The Influence of the Family

Social learning occurs first and foremost within the family unit. The relationship that we have with our family is a way to put the structure of our larger societies into context through the creation of patterns. The practices of family life create patterns through which the world is experienced (113). The reliance of the child on her parents for basic needs such as food, shelter, and security gives control to the adult caregivers in the situation. As such, the influence of adults forms a so called "micro-world" for the child where all she initially knows are those patterns of behavior that are available to her through interaction with her family. As she grows older, the child is provided with opportunity to explore other social relationships through interactions such as school, amongst peers, and within the society in which she lives.

2.5.5 The Influence of Culture

The family is influenced by a variety of societal structures. Culture is influential at all levels of family life, particularly with respect to rearing practices of the young. The patterns that the child will come to know are largely dependent on the culture in which he/she is raised. In the context of Western societies, the child may come to understand that her mother and other women in her life hold positions of financial responsibility in households, requiring them to return to work early on in the child's life and necessitating the assistance of other family members, paid caregivers or the state to intervene in the upbringing of the child. This may not be a pattern of behavior that would be observed by a child in another part of the world (or even for a child who lives within the same society), who has her mother remaining at home to be a primary caregiver to her. The children in this scenario could conceivably be living oceans apart, or next door to each other. The cultures to which their families belong can be vastly different and will impact the personalities of each child through the patterns of behavior that form their personality. These patterns of behavior observed early in life will undoubtedly impact on the thoughts, feelings and ideas of the child in later life with regards to such issues as child rearing, roles of women within society, choice of occupation, and their own personal relationships with other females.

The influence of culture does not end there. Culture encompasses such organizational structures as social classes, occupations and education. These structures are also influential on how an individual will access or interact with various aspects of the larger society. The limits of belonging to a lower social class, or having a low level of education will undoubtedly influence what individuals are able to experience within societies, just as the influence of higher education and social class can shelter individuals from some of the harsher realities of how people live. Access to learning opportunities, types of jobs and even the ability to meet basic needs such as shelter and having nutritious food will be impacted by the confines of one's culture via organizational structures. The relevance of this will manifest in the way that individuals begin to understand the intricacies of their society, and how this shapes cognitive process and behavior in dealing with culture.

2.5.6 Influences of Socialization Over the Life-Course

The early influences on the child assist with ongoing socialization. Mead postulated that a crucial step in socialization is the ability to take on the attitude of the other (114). This means that the child not only learns to recognize a certain attitude in someone else, and to understand its meaning, but that she learns to take it on for herself. The end result of this process is for the child to be able to take on differing roles: the role of a child, the role of a friend, the eventual role of a worker, a lover, or a sick/injured person. As previously mentioned, these roles will be continually refined through cognitive processes based on patterns of behavior observed, the specific culture, and for the specific situation in which it is occurring. The importance of taking on these different roles is to further inform the process of socialization. It becomes a method by which individuals are given access to experiment with various "characters" that will inform their behaviors, attitudes, and beliefs through the development of personality.

Following the points outlined above, there becomes a need to briefly describe the global influences on behavior as they pertain to recovery expectation. Individuals interpret the events that affect them and construct responses and future outcomes from a rational base that is unique to each individual (104). The ability of an individual to make a decision regarding how they recover is not arbitrary, but involves the synthesis of a variety of factors, some of which are not consciously processed, rather determined by the influences of society, culture, through behaviors on personality. It becomes important for researchers to recognize that factors not traditionally studied within medical literature are increasingly important when discussing concepts such as recovery expectation.

2.5.7 The Role of Self-Efficacy in Recovery Expectation

The concept of self-efficacy may be a crucial factor in the process of formulating recovery expectations, with research demonstrating that relationships between behavioral responses and outcome disappear when self-efficacy expectancies (a mediating variable) are partialed out (74). Self-efficacy has been described as, "a conviction that one can execute the ***behavior*** required to produce outcomes" (71). Central to this idea is that human behavior is acquired and regulated through cognitive processes that are in turn influenced by the factors such as those discussed in previous sections of this paper (the physical, social and emotional environments). An examination of Bandura's theory of self-efficacy becomes necessary to understanding expectancy formulation.

2.5.8 Self-Efficacy and Influence on Cognition

According to self-efficacy theory, cognitive processes need to be in place to acquire and retain new patterns of behavior for future events. Experiences encountered by individuals are coded symbolically, typically through language, and processed cognitively. When cognitive information is provided via interactions or observation of others, it is known as modeling (115). Cognitive processes specific to the individual are then considered in order to refine information that will be useful for future encounters. These processes are different among individuals since varying social, cultural and emotional factors will exist and be dependent on life experiences that have shaped the process of cognition for them. Also, the situation that is encountered will exert its own influence on the cognitive processing (contextual factor). An individual will observe the differing effects of their actions, and use this information to activate appropriate responses to the present situation (116). Thus, cognitive processes are influenced by specifics of the context, as well as the knowledge base and experiences that each individual brings to the situation.

Consequences of behaviors and coping style affect performance. Positive consequences serve as a force to guide behavior towards achieving an outcome by influencing self-efficacy (103), as well as exerting other important effects on behaviour. Motivation may be necessary to initiate certain behavior and persist with them. This can be generated through outcome expectancy (including recovery), which serves as a goal one is attempting to achieve, and ongoing goal setting will also be used if multiple steps are required in achieving the goal. The strength of people's convictions regarding their self-efficacy for a certain behavior influences motivation.

An important component of this is coping style. If an individual perceives that the motivation and persistence required exceeds the ability to cope within a situation, they will likely abandon the actions needed to achieve the outcome. If there is no incentive to harness motivation for a behavior then there is little chance of achieving an outcome.

Bandura has postulated 4 sources of self-efficacy expectation, those being performance accomplishments, vicarious experience, verbal persuasion and emotional arousal (71). Performance accomplishment refers to mastery of personal experience such as successfully completing or failing at a task. Strong self-efficacy expectations form after success, and diminish with failure (although the occasional failure can strengthen motivation to persist with a self-efficacy behavior towards achieving a goal). When a self-efficacy is established, it can generalize itself to other situations, even those that are not necessarily similar to the activity in which mastery was achieved. Performance accomplishments for manual handling tasks have been demonstrated in the literature.

Individuals predicted their manual handling abilities and achieved the function they predicted (74,117). Also, this predictive accomplishment was demonstrated with pain coping for individuals with fibromyalgia and chronic low back pain after a cognitive-behavioural treatment program (76). There appears to be a general agreement within the literature to support the link between performance accomplishments and self-efficacy.

Vicarious experiences rely on seeing or hearing others initiate behaviors, and allow those events to inform behavior initiation for the individual. This is a less reliable method to confer strong cognitive carry-over compared to performance accomplishments, but have been demonstrated for differing situations/conditions such as recovery from cardiac surgery (101), and diabetes management (118). Within each study, when individuals felt they shared characteristics to those whom they observed, they also felt they were able to achieve similar outcomes. Vicarious experience is also dependent on those being observed. If people of widely differing characteristics are observed to succeed with the behavior, the observed experience becomes more believable. The same can be said of an unambiguous outcome. If the individual can clearly identify a behavior or self-efficacy outcome, this will lead to a stronger impression of the vicarious experience versus one that is more ambiguous (119).

Verbal persuasion refers to using suggestion to make people believe they can cope with or successfully complete what has previously been difficult for them. Since this influence does not directly offer an authentic experience, it is a weaker manner in which to influence behavior compared to performance accomplishments. The credibility of the person will also be factored in when persuasion is being attempted. An individual who offers an opinion and is not considered as being relevant, an authority or believable will not succeed in affecting behavior change. Influence of relevant individuals has been demonstrated in studies of spouses on the self-efficacy of their partners where the spouse was able to predict self-efficacy behaviors and survival post cardiac surgery (102), as well as adjustment following abortion with perceived social support from family and friends (103). Bandura postulated that the way families support (or do not support) a patients' efforts to recover via self-efficacy is largely a social rather than an individual matter since, for example, a spouse's encouragement, persuasion, and ongoing support can influence the patient's own efficacy judgments (71). Other studies have pointed to family members acting as models for health/illness behaviors, particularly for children, which may combine an element of vicarious learning as well (120). This argument offers further impetus for the context of a biopsychosocial framework in the study of recovery expectation formulation and also points to self-efficacy being part of, and not the total scope, when viewing expectancy.

Finally, self-efficacy can be influenced through emotional arousal, which is the informative process that is elicited by situations that are stressful and taxing. This process offers information concerning personal competency and has the ability to produce anxiety that may hamper performance by eliciting an emotional response. Should these emotions overwhelm the individual performing the behavior within a specific situation, failure may likely result. Appropriate coping skills are helpful as they will allow the individual to confront situations with confidence and reduce fear allowing for stressful emotional responses to be diminished, thereby assisting with achieving an outcome (76). This in turn can assist with improving self-efficacy as the emotional arousal once experienced gives way to feelings not associated with stress or anxiety. Bandura stated that, "individuals who come to believe that they are less vulnerable than they previously assumed are less prone to generate negative thoughts in threatening situations" (71).

The sources of self-efficacy information and influence described above are dependent on how they will be cognitively appraised by the individual and are also affected by the specific social, situational, and temporal circumstances in which the events occur. Individuals are more likely to improve their sense of self-efficacy if they recognize performance was dependent on skills they possessed rather than external aides (76,94). Effort also has a role in strength of self-efficacy expectation. Should minimal effort result in a successful self-efficacy outcome, this will allow a cognitive appraisal that suggests strong self-efficacy compared to a situation where a lot of effort was used to achieve the same outcome. The cognitive meaning of the latter situation will not create as strong a self-efficacy belief as the former would. However, accomplishing a challenging task will give the individual a new sense of competence that may be helpful in generally similar, but not identical situations. Also, a temporal component exists with self-efficacy. If accomplishments are made and limited contact with the successfully completed situations ensues, self-efficacy can be more vulnerable to change. This demonstrates that self-efficacy, and therefore outcome formulation, are temporally sensitive and subject to change.

For problems that require clear-cut individual initiative, self-efficacy may be the only process required when looking at outcomes, while problems that require more than just the individual's self-efficacy should involve a construct that appreciates a social process (102). Thus, a construct for expectancy formulation requires addition of the social processes offered through relationships with family, culture, and society and their interactions with each other.

The preceding discussion reveals important components of influence on self-efficacy (performance accomplishments, vicarious learning, verbal persuasion, and emotional arousal), as well as attributes specific to the individual (motivation, coping abilities, attitude, incentives). Also, the influence of the context was discussed and recognized as an important variable. Each of these components are cognitively processed, and self-efficacy expectations for behaviors are formed. Cognitive processing was discussed as being influenced by a range of social/cultural factors. The starting point for discussion of recovery expectation formulation can start with self-efficacy since it is believed to be a critical component of this phenomenon. The influences of distal factors on personality, and subsequently cognition and behavior, are felt to be similar in the process of expectancy formulation as with self-efficacy and serves as a jumping-off point for further discussion. A recent model has been developed that discusses health expectation formulation and includes these important principles that have been discussed thus far.

2.6 Development of a Pragmatic Conceptual Model for Recovery Expectation

Until recently there have been no published papers discussing a conceptual framework for how individuals formulate recovery expectations. As reported earlier in this document, a recent paper indicated that researchers "could identify no literature that sought to translate the psychological concept of expectancy into a pragmatic and relevant conceptual model that might be used to underpin research into the attitudinal and behavioral sequelae of health expectations per se" (94). The offering of a preliminary model attempts to describe the process whereby an expectation is created, and will be used as a starting point for further discussion regarding expectation formulation. The process and description put forth by Janzen et al. with their qualitative work parallel the discussions of Bandura with his self-efficacy theory and encompass these ideas as well as adding relevant tenets producing a tidy, useable working model for health practitioners and researchers.

The definition of expectation used by the authors is the "stored associations between behaviors and resulting consequences that guide subsequent behaviors" (95). Expectancies are influential in guiding behavior, aiding recognition and influencing understanding (96), both consciously and unconsciously (121), and can vary in scope from the specific to very broad (122). This definition parallels those offered by Maddux or Bandura while also recognizing the cognitive aspects involved in expectation formulation. In addition, expectations are recognized as being socially and culturally contingent and are formed in the relation of the social and cultural contexts in which one is located including larger political and historical factors (123-125), are unique to the individual who holds them, are developed over time, and assist in generating consistent behavior (126).

Expectancy can be acquired by direct personal experience with a behavior and its consequences, through the suggestion of others, or by observing others (127). This idea is contained within the concept of self-efficacy with performance accomplishments, verbal persuasion, and vicarious learning respectively. Like self-efficacy behaviors, expectancies acquire strength as they develop to similar situations, thus more resistant to change (128). The social-cognitive model, that includes Bandura's theory of self-efficacy, is used as a framework and defended as being relevant due to the usability in the real world for understanding the processes whereby an expectation is formed and how it relates to past and future actions. Where this model appears to add to social-cognitive theory is the recognition that expectation formulation is both cyclical and longitudinal in character. The authors state that, "a trigger phenomenon causes an expectation about the future, which influences subsequent behavior and attitudes, which, in turn, influence expectations in response to subsequent trigger phenomena; at the same time, within this process, expectations may be broken down into a series of individual, simple, longitudinal causal relationships" (94). The component phases of the model hypothesized are as follows: a precipitating phenomenon; a prior understanding; cognitive processing; expectancy formulation; outcome; post-outcome cognitive processing (Appendix 4).

The precipitating phenomenon refers to the event that causes one to recognize a problem such as an injury, symptoms or a disability. This is the first step that becomes a pre-requisite for the subsequent phases of recovery expectation formulation. Following this, the authors postulate that prior understanding becomes important with the processes of experience and belief knowledge occurring. The phenomenon or the experience in question is compared with previous experience of similar events to provide a context of the situation which is socially and culturally relevant. The aspects of knowledge and belief are also included here and are described as accessed information about previous interaction of the world including personal and collective understanding, spiritual teachings, aspirations, direct encounters with other entities or situations and contact with other people. These sources each have ability to influence the phase of prior understanding and behavior/understanding, (129) and are in keeping with sociological and psychological influences known to be critical to cognitive processing (discussed earlier).

Cognitive processing refers to the phase involving an individual's sense of subjective probability, causality and temporality, which affect the aspects of self-efficacy and perceived expected subjective utility. Probability, causality and temporality are thought to be interrelated, simultaneous and mutually influential (94). The likelihood of a person believing of something happening is referred to as a sense of probability (130), with stronger probability leading to a stronger sense of eventual expectation (87). This aspect will be significantly predisposed to prior understanding of the phenomenon since accurate prediction cannot occur without some acquired knowledge.

Causality can be considered as an internal or external event or action that leads to another event or action. Internal causality refers to decisions made by the individual while external to things outside one's locus of control. Recognition of causal association is required for an expectation to form between the event, behavior and eventual outcome (131), otherwise appropriate cognitive processing does not take place towards formulation of expectation. Internal causal associations are, often at best, more amenable to change since the individual can exert a behavior to implement a difference. Time provides the individual with information about the situation and resulting expectation such as duration and order. A fracture will take several weeks to heal (depending on the injured area and severity of the fracture). The individual will form an expectation for recovery using this information. The expected order of events may be reduction of swelling, reduced appearance of bruising, increased ability to weight bear, followed by the ability to walk and then run. Should understanding be faulty in such a case, a realistic expectation for recovery from such an injury could be skewed or even unknown for return to regular activities (58). This can occur at previous phases (lack of previous experience/understanding) but is also relevant to mention at this point.

The initial steps of the cognitive process lead to two other aspects in the second theorized phase of cognition including sense of self-efficacy and perceived expected subjective utility. Self-efficacy is thought of as an expectation nested within a larger one related to a specific behavior required for the eventual outcome, a miniature version of an expectancy. Without the self-efficacy behaviors, the eventual outcome would not be realized regardless of the previous knowledge, or experience possessed by the individual. For expectations important for health outcomes, initiation of a behavior is a necessary step towards an outcome, such as mobilizing the body with rehabilitation therapies, being compliant with a treatment/medication, or thinking that one has the resources (skills, attitude, social network) to recover from an injury. The concept of self-efficacy is central to a functioning theory of expectation formulation, and this is recognized by Janzen et al. in their model.

Effort and goal type will be influenced by one's relative sense of self-efficacy with more challenging goals for behavior being linked with higher self-efficacy via determination to achieve. This will influence outcome expectation (132). Outcome expectation and self-efficacy enjoy a reciprocal relationship with increases or decreases in one cause resulting increases or decrease in the other (133). Alongside self-efficacy, the concept of subjective utility, or the value/benefit that is anticipated to come from performance of the behavior, is discussed in Janzen's et al. framework. The options available to the individual are collectively weighed and a decision is made based on both subjective and objective information, referring back to previous experience. This leads to the final phase of the cognitive process being goal formulation.

Goals are value weighted (specific to the individual and the context), relate to performance of a behavior (self-efficacy), and occur prior to the realization of an outcome. Consequences of behaviors affect expectancies, which shape goals (134), and individuals use information of their self-efficacy to formulate realistic goals that are achievable. These consequences are the realities of the context in which the situation occurs, are influenced by a variety of external factors, and are fundamental to health status (135). Consequences are not only influenced from the individuals' actions, but also by how these actions will affect family, friends, bosses, insurance systems, etc., taking in the broader context of the individual's life. Some or all of these stakeholders have an expectation of the individual that will be acknowledged, either consciously or subconsciously and become critical to the final goals and expectancy formulation the individual makes. This reciprocity is contextually specific, ever present, and often under-estimated or ignored. Regardless of this knowledge, self-efficacy remains the central tenet to goal formulation and guides expectation formulation through its influence on behavior.

The expectation formulation phase is postulated to occur next within the framework. Outcomes can be behaviors, attitudes or motivation. An example of each of these outcomes can be a behavior such, as the act of returning to work following an injury; the attitude of returning to work which may be an important aspect toward the individual's meaning of recovery; or the motivation to remain at work in the face of small set backs such as expected flare ups in pain level in initial stages. Relationships exist between behavior and attitudes, and attitudes facilitate the selection of a course of action by assessing the overall feeling the individual has to the situation (136).

If an individual has the attitude that returning to work before complete resolution of pain would only make perceived disability worse, then the outcome of return to work would become more difficult to achieve for various stakeholders striving towards a return to work plan. Her attitude might be based on the lack of co-worker support in the office, her dissatisfaction with her job, or the feeling that the heavy demands of the job caused the problem in the first place and she is owed a "complete" recovery before going back to work. This attitude can also be a symptom of what is going on at that particular moment in time within the context of her life. A different attitude might be apparent the following day or week after realizing her bank account is dwindling, or a new treatment has improved symptoms enough to give work an attempt. With attitude, the overall feeling toward return to work is what becomes the source for the behavior.

Motivation can be thought of in a similar regard to attitude but more as an internal process that also has a reciprocal relationship with behavior. As motivation increases, the behaviors needed for an expectation become more persistent (137). Using the same example, the individual who is motivated to return to work, whether for contextual factors such as keeping her boss happy, improving finances, or to hear an end to her husband's nagging, will harness available resources to achieve the required behaviors to do so. Attitude and motivation each exert a force on the eventual behavior required for the outcome, but the behavior has a reciprocal relationship that feeds back into attitudes and motivation that requires further individual reflection.

The phase of cognitive processing after outcome allows for the individual to assess the realized utility of their actions (behaviors) and refers to satisfaction with the outcome. The evaluation of satisfaction occurs by looking at what was anticipated to happen and what actually occurred. The greater the difference between the anticipated and actual, the greater the amount of dissatisfaction that will be present and vice versa. This information becomes stored and then informs the initial stages of the entire formulation cycle as being prior understanding. This phase is critical to the maintenance of the cyclical nature of expectation formulation (105).

The basic components or phases of the conceptual model offered by Janzen et al parallel the concepts of self-efficacy described by Bandura. Each realizes the importance of context, previous knowledge, the role and influence of others, and the cognitive processing of this information. The central role of self-efficacy in the conceptual model is crucial as behavior is what ultimately guides individuals towards an outcome expectancy. The aspects of goals, and perceived subjective utility within the phase of cognitive processing are really extensions of self-efficacy as described by Bandura (71,129). Outlining them as separate constructs may cause some redundancy, but is a way in which the concept of self-efficacy is more completely described.

2.7 A Need for Further Evaluation

While the model proposed by Janzen et al. is a necessary first step in the study of expectancy formulation, further discussion would assist in its refinement. The model offers a sense that each of these phases, and aspects within the phase, are moved through in a linear type fashion. It is not known whether individuals require movement through each aspect to be able to form an expectancy, (or whether other phases are also present) although the phases of precipitating phenomenon to post–outcome cognitive processing seems logical according to psychological and sociological theories and research. While the authors acknowledge the cyclical and longitudinal nature of expectancy formulation, further support for these points across a variety of conditions needs to occur. For example, qualitative methodology could be used within a variety of populations. This methodology may reveal aspects that would be valuable for theory development, and could be influenced by an individual's age, injury type or even timing over the course of recovery for the expectancy.

Timing of expectancy questions warrant further examination as coping, attitude, motivation and other components of expectancy can change when time is given to process the background information, assess the specifics of the outcome, and give relevance to the specifics of the context (76). These steps may require different amounts of time within each phase and evaluation of expectancy at just one time period might not be good enough. When individuals are asked about their expectancy too soon, or not often enough over the course of some precipitating phenomenon, this might affect the way in which the formulation cycle functions, or not provide enough information to assist with predictions of outcomes (73). There may be incomplete portions of information available to the individual to form a realistic expectancy. If lack of information persists, there can be uncertainty for expectation that results and this can lead to a longer period of time to achieve an outcome (77).

Further attention to timing of expectancy questions might also provide researchers with information of when an expectancy, through influence on behavior, might be most amenable to change. If there is an ideal time period within this model to provide appropriate treatment, it could assist with achieving important health related outcomes (138). Although this seems like an achievable goal for researchers, the larger sociological factors that are unique to individuals will require individualized focus rather than a treatment that is general or specific for a condition/diagnosis.

Just as the term recovery has different meanings for different individuals, expectancy may share a similar relationship. The types of expectations that are formulated by individuals might be ideal expectation (aspiration, desire or preferred outcome in an ideal setting), predicted (realistic, practical or anticipated outcome based on previous or personal experience), normative (what should or ought to happen related to subjective evaluation of what is deserved) or unformed (unable or unwilling to articulate their expectations) (93). Researchers should clarify which term is being referred to when an individual is being asked about their expectation formulation since they could refer to an ideal expectation in initial stages, and then with experience living with an injury, condition, etc. consider a normative or predicted expectation. Consideration of this fact is felt to assist with strengthening of a proposed conceptual model.

The experiences of an individual affected by Alzheimer's disease and her caregiver given by Janzen et al. gives some insights into how expectancy is formed for each of those persons. The processes through which they move to form expectancies is dependent on the other (the behaviors and expectations of one will influence the actions of the other). Cognitive processes are influenced by others, but the model does not specifically discuss the importance that others have on expectancy through coping skills, attitudes, motivation and self-efficacy. The effects of others on such processes has been outlined in the self-efficacy section of this paper, but is felt to be missing in the conceptual model offered by Janzen et al. The authors acknowledge the importance of context, culture and sociopolitical factors in the body of the text, but mention of significant others does not occur which is felt to be crucial in the process.

Poor coping, the influence of pain/chronic disability or mental health issues such as depression could influence the process of forming expectation particularly in the prior understanding and cognitive processing phases. These types of factors are common with many different types of medical conditions from musculoskeletal injuries, to post-surgical interventions and may therefore be encountered often by the clinician who is interested in assessing the expectancies of her patients. The presence of such factors may alter the process that is postulated for formulation and stall the progression towards developing an expectancy. A need for further quantitative and qualitative work using patients who have such important factors would further elucidate what specific situations may be encountered, and how formulation is altered in their presence. In its current form, this model would seem to be most appropriate to assist in the explanation of how uncomplicated expectancies are developed.

Within the remainder of this document, two separate studies are outlined focusing on expectations for both global recovery and for return to work. The format follows a paper-based thesis, with each chapter describing the study purpose, sampling, design, analysis and discussion of the research findings for each.

References

(1) World Health Organization. Available at: http://www.who.int/violence_injury_prevention/publications/road_traffic/world_report/main_messages_en.pdf (report).

(2) Spitzer WO, Skovron ML, Salmi LR, Cassidy JD, Duranceau J, Suissa S, et al. Scientific monograph of the Quebec Task Force on Whiplash-Associated Disorders: redefining "whiplash" and its management. Spine 1995 Apr 15;20(8 Suppl):1S-73S.

(3) Ferrari R, Russell AS. Development of persistent neurologic symptoms in patients with simple neck sprain. Arthritis Care Res. 1999 Feb;12(1):70-76.

(4) Cholewicki J, Panjabi MM, Nibu K, Babat LB, Grauer JN, Dvorak J. Head kinematics during in vitro whiplash simulation. Accid.Anal.Prev. 1998 Jul;30(4):469-479.

(5) Tencer AF, Mirza S, Bensel K. Internal loads in the cervical spine during motor vehicle rear-end impacts: the effect of acceleration and head-to-head restraint proximity. Spine 2002 Jan 1;27(1):34-42.

(6) Siegmund GP, Myers BS, Davis MB, Bohnet HF, Winkelstein BA. Mechanical evidence of cervical facet capsule injury during whiplash: a cadaveric study using combined shear, compression, and extension loading. Spine 2001 Oct 1;26(19):2095-2101.

(7) Holm LW, Carroll LJ, Cassidy JD, Hogg-Johnson S, Cote P, Guzman J, et al. The burden and determinants of neck pain in whiplash-associated disorders after traffic

collisions: results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. Spine 2008 Feb 15;33(4 Suppl):S52-9.

(8) Hogg-Johnson S, van der Velde G, Carroll LJ, Holm LW, Cassidy JD, Guzman J, et al. The burden and determinants of neck pain in the general population: results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. Spine 2008 Feb 15;33(4 Suppl):S39-51.

(9) Carragee EJ. Validity of self-reported history in patients with acute back or neck pain after motor vehicle accidents. Spine J. 2008 Mar-Apr;8(2):311-319.

(10) Guzman J, Hurwitz EL, Carroll LJ, Haldeman S, Cote P, Carragee EJ, et al. A new conceptual model of neck pain: linking onset, course, and care: the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. Spine 2008 Feb 15;33(4 Suppl):S14-23.

(11) Croft PR, Lewis M, Papageorgiou AC, Thomas E, Jayson MI, Macfarlane GJ, et al. Risk factors for neck pain: a longitudinal study in the general population. Pain 2001 Sep;93(3):317-325.

(12) Rekola KE, Keinanen-Kiukaanniemi S, Takala J. Use of primary health services in sparsely populated country districts by patients with musculoskeletal symptoms: consultations with a physician. J.Epidemiol.Community Health 1993 Apr;47(2):153-157.

(13) Kondo K, Molgaard CA, Kurland LT, Onofrio BM. Protruded intervertebral cervical disk: incidence and affected cervical level in Rochester, Minnesota, 1950 through 1974. Minn.Med. 1981 Dec;64(12):751-753.

(14) Croft P, Lewis M, Hannaford P. Is all chronic pain the same? A 25-year follow-up study. Pain 2003 Sep;105(1-2):309-317.

(15) Otremski I, Marsh JL, Wilde BR, McLardy Smith PD, Newman RJ. Soft tissue cervical spinal injuries in motor vehicle accidents. Injury 1989 Nov;20(6):349-351.

(16) Cassidy JD, Carroll LJ, Cote P, Lemstra M, Berglund A, Nygren A. Effect of eliminating compensation for pain and suffering on the outcome of insurance claims for whiplash injury. N.Engl.J.Med. 2000 Apr 20;342(16):1179-1186.

(17) Quinlan KP, Annest JL, Myers B, Ryan G, Hill H. Neck strains and sprains among motor vehicle occupants-United States, 2000. Accid.Anal.Prev. 2004 Jan;36(1):21-27.

(18) Suissa S, Harder S, Veilleux M. The Quebec Whiplash-Associated Disorders Cohort Study. Spine 1995;20:12S-20S.

(19) Berglund A, Alfredsson L, Jensen I, Bodin L, Nygren A. Occupant- and crash-related factors associated with the risk of whiplash injury. Ann.Epidemiol. 2003 Jan;13(1):66-72.

(20) Partheni M, Constantoyannis C, Ferrari R, Nikiforidis G, Voulgaris S, Papadakis N. A prospective cohort study of the outcome of acute whiplash injury in Greece. Clin.Exp.Rheumatol. 2000 Jan-Feb;18(1):67-70.

(21) Schrader H, Obelieniene D, Bovim G, Surkiene D, Mickeviciene D, Miseviciene I, et al. Natural evolution of late whiplash syndrome outside the medicolegal context. Lancet 1996 May 4;347(9010):1207-1211.

(22) Ferrari R. Whiplash--review of a commonly misunderstood injury. Am.J.Med. 2002 Feb 1;112(2):162-163.

(23) Farmer CM, Wells JK, Werner JV. Relationship of head restraint positioning to driver neck injury in rear-end crashes. Accid.Anal.Prev. 1999 Nov;31(6):719-728.

(24) Farmer C.M., Wells J.K., Lund A.K. Effects of Head Restraint and Seat Redesign on NEck Injury Risk in Rear-End Crashes. 2002.

(25) Cassou B, Derriennic F, Monfort C, Norton J, Touranchet A. Chronic neck and shoulder pain, age, and working conditions: longitudinal results from a large random sample in France. Occup.Environ.Med. 2002 Aug;59(8):537-544.

(26) Ariens GA, Bongers PM, Hoogendoorn WE, Houtman IL, van der Wal G, van Mechelen W. High quantitative job demands and low coworker support as risk factors for neck pain: results of a prospective cohort study. Spine 2001 Sep 1;26(17):1896-901; discussion 1902-3.

(27) Ostergren PO, Hanson BS, Balogh I, Ektor-Andersen J, Isacsson A, Orbaek P, et al. Incidence of shoulder and neck pain in a working population: effect modification between mechanical and psychosocial exposures at work? Results from a one year follow up of the Malmo shoulder and neck study cohort. J.Epidemiol.Community Health 2005 Sep;59(9):721-728.

(28) Cote P, van der Velde G, Cassidy JD, Carroll LJ, Hogg-Johnson S, Holm LW, et al. The burden and determinants of neck pain in workers: results of the Bone and Joint

Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. Spine 2008 Feb 15;33(4 Suppl):S60-74.

(29) Serratos-Perez JN, Mendiola-Anda C. Musculoskeletal disorders among male sewing machine operators in shoemaking. Ergonomics 1993 Jul;36(7):793-800.

(30) Anderson R. The back pain of bus drivers. Prevalence in an urban area of California. Spine 1992 Dec;17(12):1481-1488.

(31) Gerr F, Marcus M, Ensor C, Kleinbaum D, Cohen S, Edwards A, et al. A prospective study of computer users: I. Study design and incidence of musculoskeletal symptoms and disorders. Am.J.Ind.Med. 2002 Apr;41(4):221-235.

(32) Hamberg-van Reenen HH, Ariens GA, Blatter BM, Twisk JW, van Mechelen W, Bongers PM. Physical capacity in relation to low back, neck, or shoulder pain in a working population. Occup.Environ.Med. 2006 Jun;63(6):371-377.

(33) Carroll LJ, Hogg-Johnson S, van der Velde G, Haldeman S, Holm LW, Carragee EJ, et al. Course and prognostic factors for neck pain in the general population: results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. Spine 2008 Feb 15;33(4 Suppl):S75-82.

(34) Mikkelsson M, Salminen JJ, Kautiainen H. Non-specific musculoskeletal pain in preadolescents. Prevalence and 1-year persistence. Pain 1997 Oct;73(1):29-35.

(35) Mikkelsson M, Sourànder A, Salminen JJ, Kautiainen H, Piha J. Widespread pain and neck pain in schoolchildren. A prospective one-year follow-up study. Acta Paediatr. 1999 Oct;88(10):1119-1124.

(36) Hill J, Lewis M, Papageorgiou AC, Dziedzic K, Croft P. Predicting persistent neck pain: a 1-year follow-up of a population cohort. Spine 2004 Aug 1;29(15):1648-1654.

(37) Michaelson P, Sjolander P, Johansson H. Factors predicting pain reduction in chronic back and neck pain after multimodal treatment. Clin.J.Pain 2004 Nov-Dec;20(6):447-454.

(38) Bot SD, van der Waal JM, Terwee CB, van der Windt DA, Scholten RJ, Bouter LM, et al. Predictors of outcome in neck and shoulder symptoms: a cohort study in general practice. Spine 2005 Aug 15;30(16):E459-70.

(39) Bot SD, van der Waal JM, Terwee CB, van der Windt DA, Schellevis FG, Bouter LM, et al. Incidence and prevalence of complaints of the neck and upper extremity in general practice. Ann.Rheum.Dis. 2005 Jan;64(1):118-123.

(40) Cote P, Cassidy JD, Carroll LJ, Kristman V. The annual incidence and course of neck pain in the general population: a population-based cohort study. Pain 2004 Dec;112(3):267-273.

(41) Carroll LJ, Holm LW, Hogg-Johnson S, Cote P, Cassidy JD, Haldeman S, et al. Course and prognostic factors for neck pain in whiplash-associated disorders (WAD): results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. Spine 2008 Feb 15;33(4 Suppl):S83-92.

(42) Mayou R, Bryant B. Psychiatry of whiplash neck injury. Br.J.Psychiatry 2002 May;180:441-448.

(43) Sterling M, Jull G, Vicenzino B, Kenardy J, Darnell R. Development of motor system dysfunction following whiplash injury. Pain 2003 May;103(1-2):65-73.

(44) Gargan MF, Bannister GC. The rate of recovery following whiplash injury. Eur.Spine J. 1994;3(3):162-164.

(45) Cassidy JD, Carroll LJ, Cote P, Frank J. Does multidisciplinary rehabilitation benefit whiplash recovery?: results of a population-based incidence cohort study. Spine 2007 Jan 1;32(1):126-131.

(46) Drottning M, Staff PH, Sjaastad O. Cervicogenic headache (CEH) after whiplash injury. Cephalalgia 2002 Apr;22(3):165-171.

(47) Gargan M, Bannister G, Main C, Hollis S. The behavioural response to whiplash injury. J.Bone Joint Surg.Br. 1997 Jul;79(4):523-526.

(48) Norris SH, Watt I. The prognosis of neck injuries resulting from rear-end vehicle collisions. J.Bone Joint Surg.Br. 1983 Nov;65(5):608-611.

(49) Bylund PO, Bjornstig U. Sick leave and disability pension among passenger car occupants injured in urban traffic. Spine 1998 May 1;23(9):1023-1028.

(50) Jonsson H,Jr, Cesarini K, Sahlstedt B, Rauschning W. Findings and outcome in whiplash-type neck distortions. Spine 1994 Dec 15;19(24):2733-2743.

(51) Sterner Y, Toolanen G, Gerdle B, Hildingsson C. The incidence of whiplash trauma and the effects of different factors on recovery. J.Spinal.Disord.Tech. 2003 Apr;16(2):195-199.

(52) Kivioja J, Jensen I, Lindgren U. Early coping strategies do not influence the prognosis after whiplash injuries. Injury 2005 Aug;36(8):935-940.

(53) Hartling L, Pickett W, Brison RJ. Derivation of a clinical decision rule for whiplash associated disorders among individuals involved in rear-end collisions. Accid.Anal.Prev. 2002 Jul;34(4):531-539.

(54) Krafft M, Kullgren A, Tingvall C, Bostrom O, Fredriksson R. How crash severity in rear impacts influences short- and long-term consequences to the neck. Accid.Anal.Prev. 2000 Mar;32(2):187-195.

(55) Miettinen T, Airaksinen O, Lindgren KA, Leino E. Whiplash injuries in Finland--the possibility of some sociodemographic and psychosocial factors to predict the outcome after one year. Disabil.Rehabil. 2004 Dec 2;26(23):1367-1372.

(56) Berglund A, Bodin L, Jensen I, Wiklund A, Alfredsson L. The influence of prognostic factors on neck pain intensity, disability, anxiety and depression over a 2-year period in subjects with acute whiplash injury. Pain 2006 Dec 5;125(3):244-256.

(57) Suissa S, Harder S, Veilleux M. The relation between initial symptoms and signs and the prognosis of whiplash. Eur.Spine J. 2001 Feb;10(1):44-49.

(58) Carroll LJ, Cassidy JD, Cote P. The role of pain coping strategies in prognosis after whiplash injury: passive coping predicts slowed recovery. Pain 2006 Sep;124(1-2):18-26.

(59) Cote P, Hogg-Johnson S, Cassidy JD, Carroll L, Frank JW, Bombardier C. Early aggressive care and delayed recovery from whiplash: isolated finding or reproducible result? Arthritis Rheum. 2007 Jun 15;57(5):861-868.

(60) Cote P, Hogg-Johnson S, Cassidy JD, Carroll L, Frank JW, Bombardier C. Initial patterns of clinical care and recovery from whiplash injuries: a population-based cohort study. Arch.Intern.Med. 2005 Oct 24;165(19):2257-2263.

(61) Carroll LJ, Hogg-Johnson S, Cote P, van der Velde G, Holm LW, Carragee EJ, et al. Course and prognostic factors for neck pain in workers: results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. Spine 2008 Feb 15;33(4 Suppl):S93-100.

(62) Abenhaim L, Suissa S, Rossignol M. Risk of recurrence of occupational back pain over three year follow up. Br.J.Ind.Med. 1988 Dec;45(12):829-833.

(63) Rossignol M, Suissa S, Abenhaim L. Working disability due to occupational back pain: three-year follow-up of 2,300 compensated workers in Quebec. J.Occup.Med. 1988 Jun;30(6):502-505.

(64) Luime JJ, Kuiper JI, Koes BW, Verhaar JA, Miedema HS, Burdorf A. Work-related risk factors for the incidence and recurrence of shoulder and neck complaints among nursing-home and elderly-care workers. Scand.J.Work Environ.Health 2004 Aug;30(4):279-286.

(65) Viikari-Juntura E, Takala E, Riihimaki H, Martikainen R, Jappinen P. Predictive validity of symptoms and signs in the neck and shoulders. J.Clin.Epidemiol. 2000 Aug;53(8):800-808.

(66) Eriksen W, Natvig B, Knardahl S, Bruusgaard D. Job characteristics as predictors of neck pain. A 4-year prospective study. J.Occup.Environ.Med. 1999 Oct;41(10):893-902.

(67) Schibye B, Skov T, Ekner D, Christiansen JU, Sjogaard G. Musculoskeletal symptoms among sewing machine operators. Scand.J.Work Environ.Health 1995 Dec;21(6):427-434.

(68) Jonsson B.G., Persson J., Kilbom A. Disorders of the cervicobrachial region among female workers in the electronics industry: a two-year follow up. Int J Ind Ergon 1988;3:1-12.

(69) Kaptain GJ, Shaffrey CI, Alden TD, Young JN, Laws ER,Jr, Whitehill R. Secondary gain influences the outcome of lumbar but not cervical disc surgery. Surg.Neurol. 1999 Sep;52(3):217-23; discussion 223-5.

(70) Burdorf A, Naaktgeboren B, Post W. Prognostic factors for musculoskeletal sickness absence and return to work among welders and metal workers. Occup.Environ.Med. 1998 Jul;55(7):490-495.

(71) Bandura A. Self-efficacy: toward a unifying theory of behavioral change. Psychol.Rev. 1977 Mar;84(2):191-215.

(72) Maddux JE. Expectancies and the social-cognitive perspective: basic principles, processes, and variables. In: Kirsch I, editor. How Expectancies Shape Experience. Washington, DC: American Psychological Association; 1999. p. 17-39.

(73) Kapoor S, Shaw WS, Pransky G, Patterson W. Initial patient and clinician expectations of return to work after acute onset of work-related low back pain. J.Occup.Environ.Med. 2006 Nov;48(11):1173-1180.

(74) Lackner JM, Carosella AM, Fuerstein M. Pain expectancies, pain, and functional self-efficacy expectancies as dterminants of disability in patients with chronic low back disorders. Journal of Consulting and Clinical Psychology 1996;64:212-220.

(75) Mondloch MV, Cole DC, Frank JW. Does how you do depend on how you think you'll do? A systematic review of the evidence for a relation between patients' recovery expectations and health outcomes. CMAJ 2001 Jul 24;165(2):174-179.

(76) Goossens ME, Vlaeyen JW, Hidding A, Kole-Snijders A, Evers SM. Treatment expectancy affects the outcome of cognitive-behavioral interventions in chronic pain. Clin.J.Pain 2005 Jan-Feb;21(1):18-26; discussion 69-72.

(77) Gross DP, Battie MC. Work-related recovery expectations and the prognosis of chronic low back pain within a Workers' Compensation setting. JOEM 2005;47(4):428-433.

(78) Kalauokalani D, Cherkin DC, Sherman KJ, Koepsell TD, Deyo RA. Lessons from a trial of acupuncture and massage for low back pain: patient expectations and treatment effects. Spine 2001 Jul 1;26(13):1418-1424.

(79) Ottosson C, Pettersson H, Johansson SE, Nyren O, Ponzer S. Recovered? Association between self-perceived recovery and the SF-36 after minor musculoskeletal injuries. Qual.Life Res. 2007 Mar;16(2):217-226.

(80) Borkovec TD, Costello E. Efficacy of applied relaxation and cognitive-behavioral therapy in the treatment of generalized anxiety disorder. J.Consult.Clin.Psychol. 1993 Aug;61(4):611-619.

(81) Deviliya GJ, Borkovec TD. Psychometric properties of the credibility/expectancy questionnaire. J.Behav.Ther.Exp.Psychiatry 2000 Jun;31(2):73-86.

(82) Deyo RA, Walsh NE, Martin DC, Schoenfeld LS, Ramamurthy S. A controlled trial of transcutaneous electrical nerve stimulation (TENS) and exercise for chronic low back pain. N.Engl.J.Med. 1990 Jun 7;322(23):1627-1634.

(83) Luparello TJ, Leist N, Lourie CH, Sweet P. The interaction of psychologic stimuli and pharmacologic agents on airway reactivity in asthmatic subjects. Psychosom.Med. 1970 Sep-Oct;32(5):509-513.

(84) Hansson L, Berglund M. Factors influencing treatment outcome and patient satisfaction in a short-term psychiatric ward. A path analysis study of the importance of patient involvement in treatment planning. Eur.Arch.Psychiatry Neurol.Sci. 1987;236(5):269-275.

(85) Sandstrom J, Esbjornsson E. Return to work after rehabilitation. The significance of the patient's own prediction. Scand.J.Rehabil.Med. 1986;18(1):29-33.

(86) Jamison RN, Parris WC, Maxson WS. Psychological factors influencing recovery from outpatient surgery. Behav Res Ther 1987;25:31-7.

(87) Kirsch I. Response expectancy: an introduction. In: Kirsch I, editor. How Expectancies Shape Experience. Washington, DC: American Psychological Association; 1999. p. 3-13.

(88) Flood AB, Lorence DP, Ding J, McPherson K, Black NA. The role of expectations in patients' reports of post-operative outcomes and improvement following therapy. Med.Care 1993 Nov;31(11):1043-1056.

(89) Heijbel B, Josephson M, Jensen I, Stark S, Vingard E. Return to work expectation predicts work in chronic musculoskeletal and behavioral health disorders: prospective study with clinical implications. J.Occup.Rehabil. 2006 Jun;16(2):173-184.

(90) Shaw WS, Pransky G, Patterson W, Winters T. Early disability risk factors for low back pain assessed at outpatient occupational health clinics. Spine 2005 Mar 1;30(5):572-580.

(91) Franche RL, Krause N. Readiness for return to work following injury or illness: conceptualizing the interpersonal impact of health care, workplace, and insurance factors. J.Occup.Rehabil. 2002 Dec;12(4):233-256.

(92) Beaton DE, Tarasuk V, Katz JN, Wright JG, Bombardier C. "Are you better?" A qualitative study of the meaning of recovery. Arthritis Rheum. 2001 Jun;45(3):270-279.

(93) Thompson AG, Sunol R. Expectations as determinants of patient satisfaction: concepts, theory and evidence. Int.J.Qual.Health Care 1995 Jun;7(2):127-141.

(94) Janzen JA, Silvius J, Jacobs S, Slaughter S, Dalziel W, Drummond N. What is a health expectation? Developing a pragmatic conceptual model from psychological theory. Health Expect. 2006 Mar;9(1):37-48.

(95) Hohlstein LA, Smith GT, Atlas JG. An application of expectancy theory to eating disorders: development and validation of measures of eating and dieting expectancies. Psychological Assessment 1998;10:49-58.

(96) Ajzen I. The social psychology of decision making. In: Higgins ET, Kruglanski AW, editors. Social Psychology: Handbook of Basic Principles. 1st Edition ed. New York: The Guilford Press; 1996. p. 297-325.

(97) Mancuso CA, Graziano S, Briskie LM, Peterson MG, Pellicci PM, Salvati EA, et al. Randomized trials to modify patients' preoperative expectations of hip and knee arthroplasties. Clin.Orthop.Relat.Res. 2008 Feb;466(2):424-431.

(98) Myers SS, Phillips RS, Davis RB, Cherkin DC, Legedza A, Kaptchuk TJ, et al. Patient expectations as predictors of outcome in patients with acute low back pain. J.Gen.Intern.Med. 2008 Feb;23(2):148-153.

(99) de Gier M, Peters ML, Vlaeyen JW. Fear of pain, physical performance, and attentional processes in patients with fibromyalgia. Pain 2003 Jul;104(1-2):121-130.

(100) Borkan J, Reis S, Hermoni D, Biderman A. Talking about the pain: a patient-centered study of low back pain in primary care. Soc.Sci.Med. 1995 Apr;40(7):977-988.

(101) Parent N, Fortin F. A randomized, controlled trial of vicarious experience through peer support for male first-time cardiac surgery patients: impact on anxiety, self-efficacy expectation, and self-reported activity. Heart Lung 2000 Nov-Dec;29(6):389-400.

(102) Rohrbaugh MJ, Shoham V, Coyne JC, Cranford JA, Sonnega JS, Nicklas JM. Beyond the "self" in self-efficacy: Spouse confidence predicts patient survival following heart failure. J.Fam.Psychol. 2004 Mar;18(1):184-193.

(103) Major B, Cozzarelli C, Sciacchitano AM, Cooper ML, Testa M, Mueller PM. Perceived social support, self-efficacy, and adjustment to abortion. J.Pers.Soc.Psychol. 1990 Sep;59(3):452-463.

(104) Lau-Walker M. Relationship between illness representation and self-efficacy. J.Adv.Nurs. 2004 Nov;48(3):216-225.

(105) Wilson IB, Cleary PD. Linking clinical variables with health-related quality of life. A conceptual model of patient outcomes. JAMA 1995 Jan 4;273(1):59-65.

(106) Waddell G. Models of Disability Using Low Back Pain as an Example. London: Royal Society of Medicine Press; 2002.

(107) Waddell G, Burton KA, Main CJ. Screening to Identify People at Risk of Long-term Incapacity for Work: A Conceptual and Scientific Review. London: Royal Society of Medicine Press; 2003.

(108) Engel GL. The need for a new medical model: a challenge for biomedicine. Science 1977 Apr 8;196(4286):129-136.

(109) DeGood DE, Tait RC. Assessment of pain beliefs and pain comping. In: Turk DC, Melzack R, editors. Handbook of pain assessment. 2nd ed. New York: Guilford Press; 2001. p. 320-345.

(110) Waddell G. The Back Pain Revolution. 2nd ed. London: Churchill Livingstone; 2004.

(111) Heslin JM, Nelson A. Sociology: A down to earth approach. Scarborough: Allyn & Bacon Canada; 1996.

(112) Aronson E. The Social Animal. 4th ed. New York: Freeman; 1984.

(113) Berger PL, Berger B. Sociology: A Biographical Approach. New York: Basic Books Inc.; 1975.

(114) Mead M, Wolfenstein M. Childhood and Contemporary Society. Chicago: Phoenix Books; 1955.

(115) Bandura A. Psychological modeling: Conflicting Theories. Chicago: Aldine-Atherton; 1971.

(116) Dulany DE. Awareness, rules, and propositional control: A confrontation with S-R behavior theory. In: Dixon TR, Horton DL, editors. Verbal Behavior and General Behavior Theory Englewood Cliffs, N.J.: Prentice Hall; 1968.

(117) Asante AK, Brintnell ES, Gross DP. Functional self-efficacy beliefs influence functional capacity evaluation. J.Occup.Rehabil. 2007 Mar;17(1):73-82.

(118) Dye CJ, Haley-Zitlin V, Willoughby D. Insights from older adults with type 2 diabetes: making dietary and exercise changes. Diabetes Educ. 2003 Jan-Feb;29(1):116-127.

(119) Kazdin AA. Comparative effects of some variations of covert modeling. Journal of Behaviour Therapy and Experimental Psychiatry 1974;5:225-232.

(120) Turk DC, Flor H, Rudy TE. Pain and families. I. Etiology, maintenance, and psychosocial impact. Pain 1987 Jul;30(1):3-27.

(121) Kirsch I. Conditioning, expectancy, and the placebo effect: comment on Stweard, Williams and Podd. Psychological Bulletin 2004;130:341-343.

(122) Carver CS, Scheier MF. On the Self-regulation of Behaviour. Cambridge: Cambridge University Press; 1998.

(123) Hirt ER, Jay Lynn S, Payne DG, Krackow E, McCrea SM. Expectancies and memory: inferring the past from what must have been. In: Kirsch I, editor. How Expectancies Shape Experience Washington, DC: American Psychological Association; 1999. p. 93-124.

(124) Holzberg CS. Ethnicity and aging: anthropological perspectives on more than just the minority elderly. Gerontologist 1982 Jun;22(3):249-257.

(125) Fox K, Hinton WL, Levkoff S. Take up the caregiver's burden: stories of care for urban African American elders with dementia. Cult.Med.Psychiatry 1999 Dec;23(4):501-529.

(126) Goldman MS. Expectancy operation: Cognitive-neural models and architectures. In: Kirsch I, editor. How Expectancies Shape Experience Washington, DC: American Psychological Association; 1999.

(127) Stewart-Williams S. The placebo puzzle: putting together the pieces. Health Psychol. 2004 Mar;23(2):198-206.

(128) Rotter JB. Social Learning and Clinical Psychology. New York: Prentice-Hall; 1954.

(129) Bandura A. Social Foundations of Thought and Action. New Jersey: Prentice-Hall; 1986.

(130) Kyberg HE, Smokler HF. Studies in Subjective Probability. New York: Wiley and Sons; 1964.

(131) Goldman MS, Brown SA, Christiansen BA. Expectancy theory: thinking about drinking. In: Blane HT, Leonard K.D., editors. Psychological Theories of Drinking and Alcoholism New York: Guilford Press; 1987. p. 181-226.

(132) Bandura A. Self Efficacy: The Exercise of Control. New York: Freeman; 1997.

(133) Swarzer R, Fuchs R. Changing risk behaviours and adopting health behaviours: the role of self-efficacy beliefs. In: Bandura A, editor. Self-efficacy in Changing Societies New York: Cambridge University Press; 1995. p. 259-288.

(134) Klein HJ. Further evidence of the relationship between goal setting and expectancy theories. Organizational Behaviour and Human Decision Processes 1991;49:230-257.

(135) World Health Organization. International Classification of Functioning, Disability and Health. 2001.

(136) Fishbein M, Ajzen I. Belief, Attitude, Intention, and Behaviour: An Introduction to Theory and Research. Massachusetts: Addison-Wesley Publishing Compnay; 1975.

(137) Petri HL. Motivation: Theory, Research, and Applications. 3rd ed. Belmont: Wadsworth; 1991.

(138) Turner JA, Franklin G, Fulton-Kehoe D, Sheppard L, Wickizer TM, Wu R, et al. Worker recovery expectations and fear-avoidance predict work disability in a population-based workers' compensation back pain sample. Spine 2006 Mar 15;31(6):682-689.

(139) Nordin M, Carragee EJ, Hogg-Johnson S, Weiner SS, Hurwitz EL, Peloso PM, et al. Assessment of neck pain and its associated disorders: results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. Spine 2008 Feb 15;33(4 Suppl):S101-22.

Chapter 3 – Factors Associated With Expectations

Study Summary

Background: Positive expectations predict better outcomes for a variety of health conditions including recovery from WAD, but to date factors associated with positive recovery and return to expectation have not been identified.

Methods: We assessed early expectations for global recovery and return to work in a cohort of 6,015 and 2,335 individuals respectively with traffic-related whiplash injuries using polytomous and logistic regression analysis to assess which demographic, socioeconomic, pain, collision, work and psychological factors were associated with more positive expectations for global recovery and return to work at baseline. All factors were assessed using self reported, claim-related questionnaire data.

Findings: The final model for both global recovery and return to work expectations included the following statistically significant factors associated with more positive expectations: the absence of depressive symptomatology, having greater than a high school education, household earning in the highest category, female gender, and having lower levels of percent body and neck/shoulder pain due to the collision. Being greater than 30 years of age, being the driver of the vehicle, not having a history of previous neck pain, and not having low back or headache pain due to the collision were also significantly associated for positive global recovery expectations. Depressive

symptomatology and neck/shoulder pain due to collision both had the greatest effects on the estimate of the odds ratio for both outcomes.

Interpretation: To the best of our knowledge, this is the first analysis looking at factors associated with positive return to work and recovery expectations in a WAD population. A variety of both modifiable and non-modifiable variables were explored, and both variable types were found to predict global recovery and return to work expectation. The results from this analysis appear to support the notion for using a biopsychosocial approach to evaluate expectancies and their influence on important health outcomes.

3.1 Introduction

Whiplash-associated disorders (WAD) are a common problem, estimated at 300-600 cases per 100,000 population per year in North America and western Europe (1). They are costly to insurance/medical systems, and may result in long term disability in the injured person, including increased risk of future neck pain and other health complaints (2). Clinically, there is uncertainty about how to manage these injuries, and the scale and complexity of the whiplash dilemma makes whiplash injuries an important public health concern.

Studies have shown that positive expectation of recovery across a variety of medical conditions are associated with better health outcomes, increased success of rehabilitation, and are linked to reduced levels of postoperative pain. However, the number of moderate to better quality studies that have shown this association is still limited (3). Recovery expectation studies are important in understanding prognosis for whiplash injury since individuals who have neck pain can experience significant disability and lost time from work, leading to increased health and insurance expenditure (4). In some instances, return to work is used to measure recovery (5) despite the fact that some have suggested this underestimates the duration of true disability (6,7). It also becomes important to look at expectations for return to work since it is not known whether this type of expectation is similar to global recovery expectation (e.g. does positive expectation for recovery necessarily mean that one will also expects to return to work?).

Clinicians have long acknowledged patients' expectation of recovery as an influential factor in overall recovery of health problems. Due to the limited success in reducing disability using the traditional medical model, some have suggested that medical intervention for soft tissue injuries should shift from pathology to an adaptation orientation, focusing greater attention on patient education, coping, self management skills, and workplace support and accommodation (8). Such an orientation could also be influential on expectations after soft tissue/WAD injury, particularly if expectations are amenable, in some way, to change. Methods that assess patients' expectations early on in the injury experience may be useful in identifying those who have the greatest concerns regarding their recovery (9), helping to reduce the burden of WAD in this potentially vulnerable population.

However, one of the first steps in determining whether and how recovery and return to work expectations might be modified is to identify what personal and injury-related factors are associated with having such expectations. In order to explore this question, baseline information from a population-based cohort study of traffic-related whiplash-associated disorders was used to evaluate which factors may be associated with expectations for global recovery and return to work.

3.2 Objectives

The study objective is to determine which factors are associated with global recovery expectations and which factors are associated with return to work expectations following a traffic collision and resultant whiplash injury. Specifically, this question examines whether demographic factors (such as age, education, income and gender), crash related factors (position in vehicle, direction of impact, number of days to filling out claim form), pain related factors post whiplash (neck/shoulder, lower back, headache, percentage of body in pain), work related factors (job satisfaction, job status), depressive symptomatology, and previous health status (health month prior to the collision, prior history of musculoskeletal problems, prior history of claim for neck pain), all potentially important in the context of the biopsychosocial model, are associated with expectation to recover and expectation to return to work.

3.3 Study Design, Population and Data Collection

The study used a cross sectional design and included all eligible traffic-injury claimants in Saskatchewan, Canada from December 1997 to November 1999. Complete ascertainment of claimants was possible because Saskatchewan has a single traffic-injury insurer, Saskatchewan Government Insurance (SGI); and persons seeking health care for traffic injuries are required to make a claim with SGI. At the time of this study, the insurance system was a "no fault" system, which means that insurance benefits (e.g., payment for treatment, income replacement benefits, etc.) are available to the injured individual regardless of fault for the collision. Thus, the cohort was able to capture all individuals involved in a collision who required treatment, income replacement, or other benefits.

We included all eligible injury insurance claimants who completed the Application for Benefits form, which formed the baseline questionnaire, within 42 days of the collision. This questionnaire provided information on demographic and socioeconomic characteristics, data on the crash, injury-related symptoms, work status, psychological mood, and expectations for recovery and for return to work. All data used in the current study are self-reports from this baseline questionnaire.

3.4 Inclusion and Exclusion Criteria

Inclusion criteria to the study were as follows: Saskatchewan residents aged 18 and over, whose traffic injury was sustained between December 1, 1997 and November 30, 1999 and who had made their claim within 42 days of the collision. 'Whiplash injuries' were determined by a response of "yes" to the question, "Did the accident cause neck or shoulder pain?"; being injured in a motor vehicle (rather than as a pedestrian or bicyclist); and not being hospitalized for more than two days (which suggests injuries more serious than a whiplash injury). It should be noted that, because this was a self-report question, the term "shoulder" was included in the ascertainment of WAD. This is because, although clinicians consider the term 'shoulder' to refer to the shoulder joint, the general lay population frequently refer to the upper trapezius muscle as their 'shoulder' muscles, rather than part of the neck. Excluded from this cohort were those who sustained a traffic injury at work (thereby claiming under the Workers' Compensation system, rather than SGI), those who died in the collision; those with severe injuries that precluded completing the questionnaire (for example, severe brain injury or coma); those with insufficient command of the English language to complete the questionnaire; and those with serious illness that preceded the traffic injury (e.g., Alzheimer's disease) which precluded completion of the questionnaire.

To assess return to work expectations, it was necessary to identify a sub-cohort of the above claimants. Included in this sub-cohort were those individuals who were employed at the time of the collision, but had their job change (for example, modified duties) due to the collision or those who reported being off work due to the collision. In addition, they had to still be off work or working a 'modified' job at the time of completing the questionnaire.

3.5 Potential Explanatory Factors

Potential explanatory factors included the following factors measured at baseline: demographic and socioeconomic factors (age, sex, family income, education), crash related factors (position within vehicle at time of impact, direction of collision, time from collision to completing claim form), pain related factors (percentage of body pain area, current neck pain intensity, back pain intensity and headache intensity at the time of completing the questionnaire), previous history of neck claim with SGI or elsewhere, prior history of musculoskeletal problems, work related factors (work status at time of injury, off work due to the 'accident', job satisfaction), and depressive symptomatology (CES-D).

Current pain intensity was measured using an 11-point numerical rating scale (responses ranging from 0 or no pain to 10 or pain as bad as could be). Pain location and extent were assessed using a pain drawing (an anatomical diagram of anterior and posterior views of the body), on which the individual shaded-in painful areas. Percentage of body in pain was then calculated from this. Both methods have been validated and accepted as useful tools for pain measurement (10,11).

Depressive symptomatology was assessed using the Center for Epidemiologic Studies Depression Scale (CES-D) (12). The CES-D was developed for use in studies of the epidemiology of depressive symptomatology in the general population. Twenty questions are each scored from 0-3 for a possible range of scores between 0 and 60. A total score of ≥16 indicates presence of depressive symptomatology. This questionnaire is a valid and frequently used measure of depressive symptomatology (13-15).

General health prior to the collision was measured using one item from the Short Form 36 (SF-36) with the following question: "How was your health the month before the accident?" with the response options being: "excellent; very good; good; fair; poor". Prior history of musculoskeletal pain was ascertained by asking if claimants had muscle, bone or joint problems in the six months before the collision. Answering "yes" prompted further questioning whether these problems affected health "not at all; mild; moderate; severe."

Socioeconomic and demographic variables were assessed by self-report of the applicant. Questions regarding variables such as work and crash related factors were deemed to have appropriate face validity to capture the particular domain of interest. Questions regarding work included job status with the response options being: employed full-time, part-time, unemployed, retired, student, homemaker, off work (not due to injury). The use of a single question to assess these constructs has been has been used in previous studies (14,16,17).

3.6 Dependent Variables

The two dependent variables of interest are: global expectation to recover and expectations to return to work. Expectation for global recovery was assessed in the baseline questionnaire by asking, "Do you think your injury will…". The response options were: "get better soon", "get better slowly", "never get better", and "don't know". Expectation to return to work was assessed in the baseline questionnaire by the question, "If you are off work or if your job has changed because of the accident, do you think you will recover enough to return to your usual job?" with the response options being: "No"; "Yes"; "Don't Know". The use of a single question to assess expectation to return to work, and expectation for global recovery have been reported in previous studies of expectation, and demonstrated a large effect size to predict return to work one year after myocardial infarction (18), and self-rated global recovery, recovery of neck pain intensity, and improvements in self-rated disability following whiplash (1,16). No specific gold standard exists for the assessment of expectation of global recovery or return to work, but assessing the construct of recovery expectation with a single question seems to be standard across the literature given good face validity of the questions asked (16,19,21,26,31). Such a strategy also adheres to concepts arising out of qualitative work (20). In addition, the sensitivity and specificity of a single expectation to return to work question similar to ours was found to be 67.7% and 71.4% respectively in a population undergoing rehabilitation for chronic low back pain in Sweden when comparing to actual return to work 4 years later (21). It would appear that the question assessing outcome asked of subjects for the proposed study has both construct and convergent validity.

3.7 Statistical Analysis

Polytomous and logistic regression were used to assess the associations between the potential explanatory factors and expectations for global recovery and expectations to return to work (respectively). Findings were reported as odds ratios with their 95% confidence intervals. The outcome was polytomous for global recovery expectation (expect to get better soon, expect to get better slowly, never get better, don't know) and binary for return to work expectation (yes, no/don't know). The variable 'expectation to return to work' was dichotomized because this sub-cohort was relatively small, and the number of persons reporting that they did not expect to return to work was low (n = 42), which would have lead to very poor precision in the estimates. Justification for combining the "no" and the "don't know" group was twofold: First of all, the time to self-reported recovery was almost identical for those persons who did not anticipate returning to their usual employment, and those who did not know whether they would return to their usual employment. Secondly, personal and injury related characteristics were similar between these two groups.

For continuous measures (age, depressive symptomatology, number of days from collision to completing claim form, pain intensity ratings, percentage of body in pain), the data were tested for conformity to the assumption that independent variables be linearly related to the logit of the dependent variable. Age and depressive symptomatology did not meet these assumptions, so they were both categorized for analysis. Because the age distribution was highly skewed, it was categorized in the following categories: less than 24; 24-29; 30-39; 40-49; and 50 or greater. CES-D scores were dichotomized into score less than 16 and 16 and above, as validated by Radloff (12). Pain intensity, percentage of body in pain, and number of days from collision to completing claim form met the statistical assumption, so were entered into the statistical models as continuous variables.

Variables assessed for their crude relationship with *global recovery expectations* included: age group; marital status (married/common-law or not married/common-law); highest level of education (high school, less than high school and greater than high school); income (three income categories); gender; health month prior to collision (good to excellent or fair to poor); depressive symptomatology; presence of collision-related low back or headache pain (no or mild lower back or headache pain, as determined by a pain intensity rating of < 3, vs. moderate to severe pain, as indicated by either low back or headache pain rated as 3 or more on the 11-point NRS) (22); prior history of claim for neck injury with SGI or WCB (yes or no); musculoskeletal problems in the six months preceding the traffic injury (rated as none; yes with no or mild effect on health; and yes with a moderate or severe effect on health); position in vehicle (driver or passenger); direction of impact (front, side, back or other); percentage of body in pain; numerical rating scale for neck/shoulder pain; and number of days from collision to completion of claim form. For some of the categorical variables including income, marital status, level of education, health month prior to the collision, further categorization from the original responses on the claim form were made in order to have adequate cell sizes. This was done by reducing the number of potential responses from up to six for some categories, down to two or three, and by combining conceptually similar responses to improve precision of estimates for univariate analysis, and the final model. Variables included in a univariate regression analysis for *positive return to work expectations* include all of the variables listed for global recovery expectation plus job satisfaction (satisfied or not satisfied) and job status at the time of the collision (eight categories).

To identify factors associated with global expectations for recovery, each of the hypothesized explanatory variables was entered individually into a univariate regression model, and those variables whose chi square and likelihood ratio test statistics demonstrated a p-value of less than 0.20 was considered for entry into the final model. The following variables met these criteria and were considered for the final polytomous regression model: age, marital status, level of education, income level, baseline depressive symptomatology, collision related low back or headache pain, health month prior to the collision, previous history of neck injury, position in vehicle, direction of impact, gender, percentage of body in pain, and neck/shoulder numerical rating score. Using the same model building methodology as for global recovery expectation, factors associated with return to work expectations were analyzed using logistic regression for entry into the final model. Prior history of neck injury, direction of impact and job status did not show a crude association with expectation to return to work (at the $p<0.20$ cut-off), otherwise all other variables achieving significance for global recovery expectation plus the job satisfaction, and number of days from collision to completing the claim form variables were considered for the final model. Unadjusted and adjusted odds ratios and

95% confidence intervals are reported in Tables 2-3, and 5 in the results section. None of the variables listed above demonstrated collinearity. All analyses were completed using SPSS for Windows, version 16.0 (23).

3.8 Results

3.8.1 Global Recovery Expectation Cohort

Of the 8,634 claimants during the two-year inception period, 6,749 met the criteria for WAD, that is individuals who reported neck or shoulder pain as the result of the vehicle collision, and 6,021 made their claim within 42 days of the injury. Of these remaining individuals, 6 did not answer the recovery expectations question leaving 6,015 to form the study group. Median time between injury and completion of the claim form was 11 days. There was no statistically significant association between expectations to recover and time to completion of the claim form. That is, those who completed their claim later did not have better, worse, or more uncertain expectations than those who completed the claim form early. Table 1 describes the characteristics of the recovery expectation study sample, stratified by outcome.

Table 1 – Characteristics of Cohort Stratified by Recovery Expectation at Baseline (Post-injury) (N=6015)

Factor	Get Better Soon (N=1470)	Get Better Slowly (N=2519)	Never Get Better (N=112)	Don't Know (N=1914)
Age (years) [n (%)]				
< 24	258 (17.6)	572 (22.7)	30 (26.8)	375 (19.6)
24-<30	181 (12.3)	373 (14.8)	16 (14.3)	284 (14.8)
30-<40	390 (26.5)	554 (22.0)	29 (25.9)	417 (21.8)
40-<50	351 (23.9)	465 (18.5)	12 (10.7)	377 (19.7)
50 or more	290 (19.7)	555 (22.0)	25 (22.3)	461 (24.1)
Marital Status [n(%)]				
Not married/common-law	617 (42.0)	1171 (46.5)	77 (68.8)	913 (47.7)
Married/common-law	853 (58.0)	1347 (53.5)	35 (31.2)	1000 (52.3)
Number of Dependents [n(%)]				
0	851 (57.9)	1466 (58.2)	73 (65.2)	1122 (58.7)
1-2	451 (30.7)	764 (30.3)	28 (25.0)	572 (29.9)
3 or more	168 (11.4)	289 (11.5)	11 (9.8)	219 (11.4)
Education [n(%)]				
Less than high school	224 (15.3)	557 (22.1)	35 (31.2)	534 (28.0)
High school graduate	345 (23.5)	596 (23.7)	18 (16.1)	503 (26.4)
More than high school	899 (61.2)	1363 (54.2)	59 (57.2)	870 (45.6)
Income [n(%)]				
\$0 – \$20,000	352 (24.5)	792 (32.2)	49 (45.4)	648 (35.1)
\$20,001 - \$40,000	406 (28.3)	770 (31.3)	36 (33.3)	615 (33.3)
>\$40,000	677 (47.2)	895 (36.4)	23 (21.3)	582 (31.5)
Gender [n(%)]				
Male	486 (33.1)	818 (32.5)	42 (37.5)	695 (36.3)
Female	984 (66.9)	1701 (67.5)	70 (62.5)	1219 (63.7)
Position in Vehicle [n(%)]				
Driver	1197 (81.4)	1888 (75.0)	77 (68.8)	1412 (73.8)
Passenger	273 (18.6)	631 (25.0)	35 (31.2)	502 (26.2)
Direction of Impact [n(%)]				
Front	381 (26.1)	728 (29.1)	36 (32.5)	534 (28.1)
Driver Side	207 (14.2)	389 (15.6)	14 (12.5)	274 (14.4)
Passenger Side	162 (11.1)	333 (13.3)	14 (12.5)	211 (11.1)
Other	62 (4.2)	141 (5.6)	5 (4.5)	87 (4.6)
Rear	650 (44.5)	910 (36.4)	43 (38.4)	795 (41.8)
Health Month Prior [n(%)]				
Good to excellent health	1398 (95.1)	2385 (94.7)	91 (82.0)	1741 (91.0)
Fair or poor health	72 (4.90)	134 (5.30)	20 (18.0)	173 (9.00)
Baseline Depressive Symptoms [n(%)]†				
Yes	384 (26.7)	1136 (46.6)	78 (72.2)	1025 (55.8)
No	1055 (73.3)	1303 (53.4)	30 (27.8)	813 (44.2)
Headache or Back Pain [n(%)]				
Moderate or greater pain	1026 (70.4)	2112 (84.4)	101 (91.8)	1647 (87.1)
No or mild pain	432 (29.6)	391 (15.6)	9 (8.2)	243 (12.9)
Previous Neck Injury [n(%)]				
Yes	340 (23.3)	715 (28.5)	48 (43.2)	508 (26.7)
No	1126 (76.8)	1792 (71.5)	63 (56.8)	1398 (73.3)
Previous Musculoskeletal Problems [n(%)]				
No to mild effect	427 (29.1)	645 (25.6)	25 (22.5)	434 (22.7)
Moderate to severe	162 (11.0)	321 (12.8)	37 (33.3)	293 (15.4)
Absent	879 (59.9)	1550 (61.6)	49 (44.1)	1181 (61.9)
Neck/shoulder Pain mean (SD)*§	5.52 (2.06)	6.53 (1.94)	7.59 (1.97)	6.97 (2.04)
Percent Body Pain mean (SD)*‡	18.6 (13.5)	24.2 (15.6)	26.2 (14.9)	25.6 (16.8)

* Denotes continuous variable

† Yes refers to a CES-D score ≥ 16; No refers to a CES-D score < 16.

§ Neck/shoulder pain was measured on an 11-point NRS.

‡ Percentage of body in pain was assessed with a pain drawing.

Most (66.3%) of the cohort felt that their symptoms would either get better soon or slowly, while 31.8% were unsure of their course of recovery and 1.9% felt that they would never get better. Those who felt they would never get better, or didn't know how their clinical course would be had a higher proportion with less than a high school education and more depressive symptomatology compared to the groups feeling they would get better.

Missing or incomplete information for one or more of the variables occurred in 509 (8.5%) individuals, and were subsequently excluded from the analysis. Incomplete or missing information was most often noted for CES-D score (193 individuals), income (171 individuals), numerical rating for neck/shoulder pain (83 individuals), and presence of low back or headache pain post collision (54 individuals).

In total, 14 factors were included in the recovery expectation final model, that is, they were associated with the dependent variable at a $p<0.20$ level, (their crude odds ratios listed in Table 2). The final polytomous regression model for recovery expectation is listed in Table 3.

Table 2 - Crude Odds Ratios and 95% Confidence Intervals For Factors Associated With Positive Global Recovery Expectation

Factor	Get Better Slowly¶ OR (95% CI)	Never Get Better¶ OR (95% CI)	Don't Know¶ OR (95% CI)
Age Group (years)			
< 24	1.16 (0.94-1.42)	1.35 (0.77-2.35)	0.91 (0.74-1.14)
24-<30	1.08 (0.86-1.35)	1.03 (0.53-1.97)	0.99 (0.78-1.25)
30-<40	0.74 (0.61-0.90)*	0.86 (0.50-1.50)	0.67 (0.55-0.82)*
40-<50	0.69 (0.57-0.84)*	0.40 (0.20-0.80)*	0.68 (0.55-0.83)*
50 or more	1.00	1.00	1.00
Marital Status			
Not married/common-law	1.20 (1.06-1.37)*	3.04 (2.01-4.60)*	1.26 (1.10-1.45)*
Married/common-law	1.00	1.00	1.00
Education			
Less than high school	1.64 (1.38-1.96)*	2.38 (1.53-3.71)*	2.46 (2.05-2.95)*
High school graduate	1.14 (0.97-1.33)	0.80 (0.46-1.37)	1.50 (1.28-1.78)*
More than high school	1.00	1.00	1.00
Income (Cdn dollars)			
$0 – $20,000	1.70 (1.45-2.00)*	4.10 (2.46-6.84)*	2.14 (1.81-2.54)*
$20,001 - $40,000	1.44 (1.22-1.68)*	2.61 (1.53-4.47)*	1.76 (1.49-2.08)*
>$40,000	1.00	1.00	1.00
Gender			
Male	0.97 (0.85-1.12)	1.22 (0.82-1.81)	1.15 (1.00-1.33)*
Female	1.00	1.00	1.00
Position in Vehicle			
Passenger	1.47 (1.25-1.72)*	1.99 (1.31-3.04)*	1.56 (1.32-1.84)*
Driver	1.00	1.00	1.00
Direction of Impact			
Front	1.37 (1.16-1.60)*	1.44 (0.90-2.26)	1.15 (0.97-1.36)
Driver side	1.34 (1.10-1.63)*	1.02 (0.55-1.91)	1.08 (0.88-1.33)
Passenger Side	1.47 (1.19-1.82)*	1.31 (0.70-2.45)	1.07 (0.85-1.34)
Other	1.62 (1.19-2.23)*	1.22 (0.47-3.19)	1.15 (0.82-1.62)
Rear	1.00	1.00	1.00
Health Month Prior			
Good to excellent health	0.92 (0.68-1.23)	0.23 (0.14-0.40)*	0.52 (0.39-0.69)*
Fair or poor health	1.00	1.00	1.00
Baseline Depressive Symptoms†			
Yes	2.40 (2.08-2.76)*	7.14 (4.61-11.1)*	3.46 (2.99-4.02)*
No	1.00	1.00	1.00
Headache or Back Pain			
Moderate or greater pain	2.27 (1.95-2.66)*	4.73 (2.37-9.43)*	2.85 (2.40-3.40)*
No or mild pain	1.00	1.00	1.00
Previous Neck Injury			
Yes	1.32 (1.14-1.53)*	2.52 (1.70-3.74)*	1.20 (1.03-1.41)*
No	1.00	1.00	1.00
Previous Musculoskeletal Problems			
No to mild effect	0.86 (0.74-0.99)*	1.05 (0.64-1.72)	0.76 (0.65-0.89)*
Moderate to severe	1.12 (0.91-1.38)	4.10 (2.59-6.48)*	1.35 (1.09-1.66)*
Absent	1.00	1.00	1.00
Neck/shoulder Pain§	1.27 (1.23-1.31)*	1.70 (1.52-1.90)*	1.42 (1.37-1.47)*
Percent Body Pain‡	1.03 (1.02-1.03)*	1.04 (1.03-1.05)*	1.03 (1.03-1.04)*

¶ Comparison Group is "Get Better Soon"

* Denotes significant at $p < 0.05$

† Yes refers to a CES-D score ≥ 16; No refers to a CES-D score < 16.

§ Neck/shoulder pain was measured on an 11-point NRS.

‡ Percentage of body in pain was assessed with a pain drawing.

Table 3 - Adjusted Odds Ratios and 95% Confidence Intervals For Factors Associated With Positive Global Recovery Expectation

Factor	Get Better Slowly¶ OR (95% CI)	Never Get Better¶ OR (95% CI)	Don't Know¶ OR (95% CI)
Age Group (years)			
< 24	1.15 (0.89-1.48)	1.32 (0.66-2.64)	0.90 (0.68-1.18)
24-<30	1.04 (0.81-1.35)	1.14 (0.53-2.44)	1.07 (0.81-1.42)
30-<40	0.74 (0.59-0.92)*	1.10 (0.58-2.10)	0.74 (0.58-0.93)*
40-<50	0.73 (0.59-0.92)*	0.43 (0.19-0.95)*	0.77 (0.61-0.98)*
50 or more	1.00	1.00	1.00
Marital Status			
Not married/common-law	0.98 (0.82-1.17)	2.71 (1.58-4.63)*	1.10 (0.91-1.34)
Married/common-law	1.00	1.00	1.00
Education			
Less than high school	1.38 (1.12-1.70)*	1.79 (1.05-3.07)*	2.10 (1.69-2.61)*
High school graduate	1.06 (0.89-1.26)	0.82 (0.46-1.46)	1.44 (1.19-1.73)*
More than high school	1.00	1.00	1.00
Income (Cdn dollars)			
\$0 – \$20,000	1.15 (0.93-1.41)	1.12 (0.60-2.08)	1.26 (1.00-1.57)*
\$20,001 - \$40,000	1.20 (1.00-1.43)*	1.37 (0.76-2.46)	1.34 (1.10-1.62)*
>\$40,000	1.00	1.00	1.00
Gender			
Male	1.18 (1.01-1.38)*	1.80 (1.14-2.85)*	1.38 (1.17-1.63)*
Female	1.00	1.00	1.00
Position in vehicle			
Passenger	1.44 (1.20-1.72)*	2.14 (1.31-3.48)*	1.43 (1.18-1.73)*
Driver	1.00	1.00	1.00
Direction of Impact			
Front	1.24 (1.04-1.48)*	1.15 (0.69-1.90)	0.93 (0.76-1.12)
Driver side	1.22 (0.98-1.51)	0.69 (0.34-1.41)	0.87 (0.69-1.11)
Passenger Side	1.23 (0.97-1.55)	0.77 (0.37-1.57)	0.78 (0.60-1.00)
Other	1.34 (0.94-1.89)	0.86 (0.31-2.40)	0.71 (0.48-1.05)
Rear	1.00	1.00	1.00
Health Month Prior			
Good to excellent health	1.18 (0.85-1.65)	0.61 (0.32-1.18)	0.75 (0.54-1.05)
Fair or poor health	1.00	1.00	1.00
Baseline Depressive Symptoms†			
Yes	1.75 (1.49-2.04)*	4.21 (2.60-6.82)*	2.31 (1.96-2.73)*
No	1.00	1.00	1.00
Headache or Back Pain			
Moderate or greater pain	1.31 (1.09-1.57)*	1.50 (0.69-3.27)	1.31 (1.07-1.62)*
No or mild pain	1.00	1.00	1.00
Previous Neck Injury			
Yes	1.30 (1.10-1.54)*	1.87 (1.17-2.98)*	1.06 (0.88-1.28)
No	1.00	1.00	1.00
Previous Musculoskeletal Problems			
No to mild effect	0.89 (0.75-1.04)	1.21 (0.70-2.11)	0.81 (0.67-0.97)*
Moderate to severe	1.02 (0.81-1.30)	3.16 (1.80-5.53)*	1.05 (0.82-1.35)
Absent	1.00	1.00	1.00
Neck/shoulder Pain§	1.18 (1.14-1.23)*	1.48 (1.31-1.68)*	1.30 (1.24-1.35)*
Percent Body Pain‡	1.02 (1.01-1.02)*	1.01 (1.00-1.03)	1.02 (1.01-1.02)*

¶ Comparison Group is "Get Better Soon"

* Denotes significant at $p < 0.05$

† Yes refers to a CES-D score ≥ 16; No refers to a CES-D score < 16.

§ Neck/shoulder pain was measured on an 11-point NRS.

‡ Percentage of body in pain was assessed with a pain drawing.

Factors associated with claimants predicting they would 'get better slowly'

In the adjusted analysis, the following factors demonstrated a statistically significant association with the prediction of getting better slowly: age, education level, gender, income level, position in vehicle, baseline depressive symptoms, presence of low back or headache pain due to the collision, neck/shoulder pain due to collision, and percentage of body in pain due to collision. That is, in comparison with those predicting that they would get better quickly, those predicting a slow recovery were less educated, were less likely to be between 30-49 years old, had low income, were more likely to be male, more likely to be passengers, were more likely to have been injured in a frontal collision, had more depressive symptomatology, more low back and/or headache pain, and had a history of an insurance claim for neck pain. In addition, they had a greater percentage of their body in pain, and more intense neck or shoulder pain. For each one point increase in percentage of body pain, and numerical rating for neck/shoulder pain, the odds of anticipating 'getting better slowly' increased by 1% and 18% respectively compared to reporting 'getting better soon'. The change of the odds ratio for the neck pain NRS for each one point increase is substantial. Otherwise, each of the remaining variables from the final model demonstrated, at best, a modest effect; that is an odds ratio of less than two to predict the expectation to 'get better slowly'.

Factors associated with claimants predicting they would 'never get better'

Explanatory factors demonstrating a statistically significant relationship predicting 'never get better' include: age, marital status, education, gender, position in vehicle, baseline depressive symptoms, previous neck injury, prior history of musculoskeletal problems, and neck/shoulder pain due to collision. Compared to those who felt they would 'get better quickly', those predicting never getting better were more likely to report the following: less education, not between age 40-49 years, be male, report being vehicle passengers, have depressive symptoms, have a history of previous neck pain, and experience moderate to severe impact on daily functioning from previous musculoskeletal pain. Also this group had more intense neck or shoulder pain, with each one point increase in numerical rating for neck/shoulder pain, odds of reporting 'never getting better' increased by 48% compared to reporting 'get better soon'. The NRS rating for neck/shoulder pain demonstrates a substantial effect to change the odds ratio for each one point increase. Presence of depressive symptomatology, not being married/common-law, age category and having a history of moderate to severe impacts on life due to previous musculoskeletal injuries demonstrated moderate effects, that is having an odds ratio greater than two, to predict those reporting 'never get better'. Otherwise, remaining variables had modest predictive effect on the outcome (odds ratios less than two).

Factors associated with claimants predicting they 'don't know'

The adjusted analysis demonstrated a statistically significant association with the prediction of responding 'don't know' for the following factors: age, education level, gender, income level, position in vehicle, baseline depressive symptoms, presence of low back or headache pain due to the collision, prior history of musculoskeletal problems, neck/shoulder pain due to collision, and percentage of body in pain due to collision. Compared to those who felt they would get better quickly, those predicting 'don't know' were more likely to be less well educated, less likely to be between 30-49 years, have low household income, be male, be vehicle passengers, have depressive symptoms, have more headache or low back pain, and be those with no to mild health effects on daily functioning from previous musculoskeletal problems. Also, for each 1 point increase in percentage of body pain, and numerical rating for neck/shoulder pain, the odds of reporting 'don't know' increased by 2% and 30% respectively compared to reporting 'getting better soon'. The change of the odds ratio for the neck pain NRS rating for each one point increase is substantial. Those with depressive symptomatology and with less than a high school education more than doubled the likelihood of not knowing what their global recovery would be compared with those who reported 'get better quickly'. Otherwise all other variables demonstrated, at best, a modest effect (an odds ratio of less than two) to predict the answer 'don't know'.

Appendix 1 lists crude and adjusted odds ratios for including the position in vehicle as a trichotomous rather than dichotomous variable (possible positions being driver; front seat passenger; or back seat passenger). As a trichotomous variable, the statistical significance of the front seat passenger is noted, but is not demonstrated for the back seat passenger. This is likely due to the fact that the cell size for the back seat passenger (n=213) was small in comparison to the front seat passenger (n=1088) and driver (n=4205) variable. Otherwise, minimal changes to the adjusted odds ratios of the other variables were noted from the inclusion of the trichotomous position in vehicle variable.

3.8.2 Return to Work Expectation Cohort

Inclusion to the return to work expectation cohort included those individuals who were employed at the time of the collision, but had their job change (assessed by the question "are you working reduced hours or modified/different duties because of the accident?"), or those who reported being off work (assessed by the question "were you off work due to the accident?" and "how many days have you been off work so far?" and "are you still off work due to the accident"). This cohort had a total of 2,411 individuals who satisfied these conditions, with 5 individuals not answering the expectations for return to work question (assessed by the question "if you are off work or if your job has changed because of the accident, do you think you will recover enough to return to your usual job?" No; Yes; Don't Know; Not Applicable), leaving a remaining 2,406 individuals with baseline data. There were 71 individuals who reported being off work or performing modified work duties who answered 'not applicable' to the return to work expectations question. Not applicable was not used as a possible outcome in the analysis leaving a remaining 2,335 for analysis. Misunderstanding of the question, previous history of being off work prior to vehicle collision, or being off work for reasons other than the collision may be possible reasons for use of the 'not applicable' response. Characteristics of the return to work expectation sample are reported in Table 4, and the 'not applicable' group are reported in Appendix 2.

Table 4 - Characteristics of Cohort Stratified by Return to Work Expectation at Baseline (Post-injury) (N=2335)

Factor	**No or Don't Know (N=795)**	**Yes (N=1540)**
Age (years) [n(%)]		
< 24	175 (22.0)	333 (21.6)
24-<30	133 (16.7)	232 (15.1)
30-<40	211 (26.5)	394 (25.6)
40-<50	143 (18.0)	338 (21.9)
50 or more	133 (16.7)	243 (15.8)
Marital Status [n(%)]		
Married/common-law	402 (50.6)	702 (45.6)
Not married/common-law	392 (49.4)	837 (54.4)
Number of Dependents [n(%)]		
0	443 (55.7)	885 (57.5)
1-2	258 (32.5)	482 (31.3)
3 or more	94 (11.8)	173 (11.2)
Education [n(%)]		
Less than high school	212 (26.7)	305 (19.8)
High school graduate	228 (28.7)	389 (25.3)
More than high school	354 (44.6)	843 (54.8)
Income [n(%)]		
$0 – $20,000	254 (32.6)	389 (25.7)
$20,001 - $40,000	272 (34.9)	501 (33.1)
>$40,000	254 (32.6)	622 (41.1)
Gender [n(%)]		
Female	435 (54.7)	960 (62.3)
Male	360 (45.3)	580 (37.7)
Health Month Prior [n(%)]		
Fair or poor health	42 (5.3)	57 (3.7)
Good to excellent health	752 (94.7)	1483 (96.3)
Baseline Depressive Symptoms [n(%)]†		
Yes	526 (68.8)	752 (50.0)
No	238 (31.2)	751 (50.0)
Headache or Back Pain [n(%)]		
Moderate or greater pain	718 (91.3)	245 (16.0)
Less than moderate pain	68 (8.7)	1287 (84.0)
Previous Neck Injury [n(%)]		
Yes	215 (27.2)	403 (26.3)
No	575 (72.8)	1129 (73.7)
Previous Musculoskeletal Problems [n(%)]		
No to mild effect	174 (21.9)	386 (25.1)
Moderate to severe effect	88 (11.1)	148 (9.6)
Absent	532 (67.0)	1003 (65.3)
# Days to Completing Form* mean (SD)	12.6 (8.9)	11.8 (8.5)
Percent Body Pain* mean (SD)‡	29.3 (17.5)	25.0 (15.9)
Neck/shoulder Pain* mean (SD)§	7.42 (1.82)	6.63 (1.99)

* Denotes continuous variable

† Yes refers to a CES-D score ≥ 16; No refers to a CES-D score < 16.

§ Neck/shoulder pain was measured on an 11-point NRS.

‡ Percentage of body in pain was assessed with a pain drawing.

Most (66.0% or 1540 subjects) of the cohort felt that they would get well enough to return to their usual job, while 32.2% (753 subjects) were unsure and 1.8% (42 subjects) felt that they would not return to their usual job. Those who responded "no or don't know" had a higher proportion with less than high school education, males, those with depressive symptomatology at baseline, and had higher average levels of headache or back pain due to the collision.

Missing or incomplete information for one or more of the variables used for the final analysis occurred in 156 (6.7%) of individuals, and were excluded from analyses. CES-D score (68 individuals), income (43 individuals), numerical rating for neck/shoulder pain (29 individuals), and presence of low back or headache pain post collision (17 individuals) questions were most often missing or incomplete.

In total, 16 factors were considered for the return to work expectation final model, 14 of which demonstrated a significant association ($p<0.20$) with the outcome following the crude analysis. All 14 were included in the multivariable logistic analysis, and the crude and adjusted odds ratios and 95% confidence intervals are listed for these variables in Table 5.

Table 5 – Crude and Adjusted Odds Ratios and 95% Confidence Intervals For Factors Associated With Positive Return to Work Expectation

Factor	Crude OR (95% CI) ¶	Adjusted OR (95% CI) ¶
Age Group (years)		
< 24	1.00	1.00
24-<30	0.92 (0.69-1.12)	0.89 (0.65-1.21)
30-<40	0.98 (0.77-1.26)	0.90 (0.67-1.21)
40-<50	1.24 (0.95-1.62)	1.15 (0.83-1.60)
50 or more	0.96 (0.73-1.27)	0.87 (0.62-1.23)
Marital Status		
Married/common-law	1.00	1.00
Not married/common-law	0.82 (0.69-0.97)*	0.92 (0.73-1.16)
Education		
Less than high school	1.00	1.00
High school graduate	1.19 (0.93-1.15)	1.13 (0.87-1.48)
More than high school	1.66 (1.34-2.05)*	1.56 (1.22-2.00)*
Income (Cdn dollars)		
$0 – $20,000	1.00	1.00
$20,001 - $40,000	1.20 (0.97-1.49)	1.11 (0.87-1.42)
>$40,000	1.60 (1.29-1.98)*	1.32 (1.01-1.73)*
Gender		
Female	1.00	1.00
Male	0.73 (0.61-0.87)*	0.67 (0.55-0.81)*
Position in Vehicle		
Passenger	1.00	1.00
Driver	1.17 (0.95-1.44)	1.14 (0.90-1.43)
Job Satisfaction		
Dissatisfied	1.00	1.00
Satisfied	1.26 (0.98-1.63)	1.25 (0.94-1.65)
Health Month Prior		
Fair or poor health	1.00	1.00
Good to excellent health	1.45 (0.97-2.19)	1.25 (0.94-1.65)
Prior Musculoskeletal		
Absent	1.00	1.00
No to mild	1.17 (0.96-1.45)	1.06 (0.84-1.34)
Moderate to severe	0.89 (0.67-1.19)	0.95 (0.68-1.31)
Baseline Depressive Symptoms†		
Yes	1.00	1.00
No	2.21 (1.84-2.66)*	1.75 (1.43-2.14)*
Headache or Back Pain		
Moderate or greater pain	1.00	1.00
Less than moderate pain	2.01 (1.51-2.67)*	1.33 (0.98-1.82)
# Days to Completing Form	0.99 (0.98-1.00)*	0.99 (0.98-1.01)
Percent Body Pain‡	0.99 (0.98-0.99)*	0.99 (0.98-0.99)*
Neck/shoulder Pain[§]	0.80 (0.77-0.84)*	0.84 (0.80-0.88)*

¶ Comparison group is those that reported “no or don’t know” to return to work expectation question

* Denotes significant at $p < 0.05$

† Yes refers to a CES-D score ≥ 16; No refers to a CES-D score < 16.

§ Neck/shoulder pain was measured on an 11-point NRS.

‡ Percentage of body in pain was assessed with a pain drawing.

The final model shows the following factors to have a statistically significant ($p<0.05$) association with expectations to return to work: education, income, gender, depressive symptomatology, percentage of body area in pain, and numerical rating for neck/shoulder pain. Those having positive expectations about returning to work had higher education (more than high school), and those in the highest income bracket had a 32% greater odds of reporting positive expectation compared to those who earned the least. Women and those who did not have depressive symptomatology (scores < 16 on the CES-D) were also more likely to report a positive return to work expectation, but the effect of these variables was modest at best. In addition, for each 1 point increase in percentage of body pain, the odds of reporting positive return to work expectation decreased by 1%, and for every one point increase in numerical rating for neck/shoulder pain, odds of positive return to work expectation decreased by 16%. The NRS score for neck/shoulder pain demonstrates a substantial effect on the odds ratio. Otherwise, each variable demonstrated, at best, a modest effect to predict positive return to work expectation.

3.9 Discussion

To the best of our knowledge, this is the first analysis looking at factors associated with positive return to work and recovery expectations for a WAD population. A variety of both modifiable and non-modifiable variables were explored, and both variable types were found to be associated with global recovery and return to work expectation. The results from this analysis appear to support the notion for using a biopsychosocial approach to evaluate expectancies and their influence on important health outcomes.

3.9.1 Recovery Expectations

Variables associated with positive global recovery expectation include absence of depressive symptomatology, being greater than 30 years of age, having greater than a high school education, household earning in the highest category, female gender, being the driver of the vehicle, not having a history of previous neck pain, not having low back or headache pain due to the collision, and having lower levels of percent body and neck/shoulder pain due to the collision. Absence of depressive symptomatology predicted the greatest odds of reporting "getting better quickly" for categorical variables, while numerical rating score for neck/shoulder pain also had a substantial effect.

Those with depressive symptoms are almost twice as likely to state they are going to get better slowly, more than twice as likely to state they don't know, and over four times more likely to state they would never get better compared to those who said they would get better quickly and did not have depressive symptoms. Depressive symptomatology has previously been shown to be common following whiplash injury in those initially reporting no pre-injury mental health issues. Carroll et al. reported that 42.3% of subjects developed depressive symptoms within 6 weeks of their injury, and an additional 17.8% developed symptoms over a one-year follow-up (14). Also, those with pre-injury mental health problems increased the risk of later onset depressive symptoms and a recurrent or persistent course of early onset depressive symptoms. Our study subjects were eligible to participate if they completed their claim form within 42 days of the collision, therefore reported CES-D score may reflect an early onset of depression due to the collision rather than pre-existing depressive symptoms. Our findings suggest that depressive symptoms are associated with recovery expectations when assessed early in the recovery process, but the high prevalence of early onset depressive symptoms post-collision may account for some of this association. Our findings add to the biopsychosocial literature that feelings and perceptions may profoundly affect biological disease processes through behavioral and non behavioral mechanisms (24).

Self reported pain intensity also shows an impact on positive recovery expectation. With respect to the 11-point numerical rating scale for neck/shoulder pain used at baseline, every one-unit increase in scores means individuals are at 30-48% reduced odds of reporting positive global recovery expectation (get better quickly). Previous papers performing secondary analyses for factors associated with expectancies have not reported pain symptoms as being influential (28,34). This may be an artifact of pain measurement, or due to the main study objectives being not aligned to best answer questions relating to expectancies. The impact of pain on recovery is likely multi-factorial, informing behaviours required for recovery, and also mediating the resulting consequences of these behaviours (25,26). Previous literature has noted that definitions of recovery may also differ among individuals, pain being a central tenet for this definition (27), with one study showing that abolition of pain appears to be paramount for reporting self-perceived recovery for a WAD population (28). Our findings suggest that individual pain reports are necessary and informative as associated factors of expectations for global recovery and return to work.

Collision related factors have not been informative for predicting course or prognosis of WAD following motor vehicle collision (29). However, our findings show drivers are more likely to report positive global recovery expectation compared to passengers. When the passenger variable was dichotomized to front or rear seat, the statistical significance of the rear seat passenger variable was lost (likely due to small cell size). A modest sized odds ratio was noted for the position in vehicle variable, but this novel finding may suggest that despite similar impact forces exerted on the spine, other processes may be at play to inform global recovery expectation between passengers and drivers. While collision factors may not directly inform on course or prognosis of WAD, our results suggest that these factors, particularly position in vehicle, may be part of a causal pathway, with expectation being an intermediate variable, between collision related factors and recovery.

Those who reported they "didn't know" what their course of recovery would be generally demonstrated adjusted odds ratios between those who felt they would recover slowly, and those who felt they would not recover at all for our associated factors. For example, males reporting an uncertain recovery rate (OR = 1.38) were between those reporting slow recovery (OR = 1.18), and those reporting they would not recover (OR = 1.80). Also, for subjects with neck/shoulder pain due to the collision those reporting uncertain recovery rate (OR = 1.30) were between those reporting slow recovery (OR = 1.18), and those reporting they would not recover (OR = 1.48). Carroll et al. reported similar findings when measuring the independent association between recovery expectation and time to self-reported recovery. Persons who did not know how quickly they would recover actually recovered at a rate approximately mid-way between those anticipating a slow recovery, and those anticipating that they would never recover (16).

3.9.2 Return to Work Expectation

Important variables associated with positive return to work expectation include absence of depressive symptomatology, having greater than a high school education, household earnings in the highest category, female gender, and having lower levels of percent body and neck/shoulder pain due to the collision. The categorical variables that demonstrated statistical significance in the final model conferred a modest effect (all OR's were less than two) on the ability to predict positive return to work expectation, but the neck/shoulder pain intensity variable was an important factor in its ability to alter the estimate of the odds ratio.

Interestingly, variables that might have been expected to be important from a psychosocial perspective such as job satisfaction and job status did not contribute to the overall model for factors associated with positive return to work expectation. It may be that complex constructs such as job satisfaction were not adequately assessed with a single question in the application for benefits form. Others have commented that the value of job satisfaction cannot be understated due to its high correlations with important job outcomes such as job involvement, stress, turnover, and employee attendance (30). Characteristics of jobs including pay, relations with co-workers, supervisors, and job security have been viewed as important components of satisfaction, but in the interest of keeping the benefits form brief, the number of questions pertaining to work related variables did not explore these areas. Also, job satisfaction may not be an independent associated factor of return to work expectation, but could influence expectation via factors that are associated with constructs of coworker cohesion, problems with coworkers, social isolation and 'trouble at work'. The importance of studying work related factors associated with expectations has been called for in the literature and may warrant further examination (3,5,31), but our finding is in keeping with a systematic review reporting that job satisfaction is not predictive of work outcome for those with low back pain (32).

Surprisingly, almost one third (32.2%) of individuals were unsure of whether they would be able to return to their usual work, while only 1.8% felt they would not be able to. Our findings show that those who answered "don't know" and "no" to our return to work expectation question had a remarkably similar actual rate to self-reported recovery. Potentially modifiable factors such as expectation could be relevant clinically for those who are unsure as they may be more likely to respond to interventions aimed at changing expectation. This has been observed in an educational trial showing that early educational interventions (administered using a videotape) that included reassurance and education are beneficial for WAD patients, and it is likely that this strategy works by modifying patient expectations (33). Similar findings have been demonstrated with educational programs for patients undergoing total knee arthroplasty to modify expectations (34).

3.9.3 Similarities and Differences in Factors Associated With Global Expectations of Recovery and Expectations to Return to Work

Surprisingly, nearly identical proportions in each cohort had strong negative or unsure thoughts about the outcome of interest (1.9% responding 'no' to global recovery question versus 1.8% for return to work and 31.8% responding 'don't know' for global recovery versus 32.2% for return to work expectation). This could be because those who had a negative or unsure global recovery expectation also had a negative or unsure return to work expectation but this finding may offer rationale for using return to work as a surrogate measure of recovery since individuals may think of these two constructs in a similar way. Lending support to this argument, an unpublished study shows that those with positive return to work expectation have a 42% faster rate of self reported global recovery (after adjusting for confounders) than those who have more negative expectations (35).

Interestingly, each of the variables in the final model demonstrating an association with return to work expectation were also associated with global recovery expectation (education, income, gender, depressive symptoms, body pain percentage, and neck/shoulder NRS). Both groups showed similarities for positive expectations (those with more education, more income, no depressive symptoms and females). It appears that our measures for previous musculoskeletal problems, presence of headache/back pain due to the collision, position in vehicle, and prior neck claim were not as informative for associations with return to work expectation as they were for global recovery expectation. It may be that a past history of musculoskeletal problems provides more influence for knowledge and attitudes required for formulation of global recovery expectation, and factors other than these are necessary for return to work expectation (such as co-worker relations, job stress, physical demands for job, etc.) (26). Alternatively, expectations about global recovery following WAD may be formed from distinct components, one of which might be ability return to work. Therefore, individuals may view 'recovery' as being able to return to work and be a necessary step prior to reporting global recovery. This would be supported by our findings which show that each of the associated factors for return to work was also associated with global recovery expectation. Distinct expectation components of global recovery have been described for other clinical populations with regards to recovery from surgery (36).

3.10 Strengths and Limitations

One of the important strengths in our data is complete ascertainment of information. All claimants completed the baseline questionnaire (since that was the claim application form), so there is no selection bias (although it should be understood that these data included only those who made an insurance claim for their injuries and did this within 42 days). There was also minimal missing data in the factors assessed, again mitigating against the likelihood of selection bias.

A broad range of demographic, social, work, psychological and crash-related factors were examined for their associations to expectations. Measurement of important variables such as depressive symptoms was done using valid, reliable instruments, such as the CES-D, thus minimizing the likelihood of information bias.

The assessment of expectations may be biased by response time. Since subjects had 6 weeks to respond to the baseline questionnaire, those who respond early following the event may be more likely to be unsure of how they will recover resulting in underestimation of outcome, or those with few symptoms initially may overestimate their expectation to return to work but may develop increased symptoms at a later date. The questionnaire form provided a "don't know" answer to our expectations questions. Our analysis accounted for this variable and where appropriate it is reported separately. As an additional check, we also included the time from collision to completion of the claim form as a variable to examine whether time to completing the questionnaire form was associated with the recovery responses, but inclusion of this factor did not become important to either of our final models.

The practical implications of our analyses are two-fold. One, identifying important demographic, socioeconomic, crash, pain, and depression related information at baseline following a vehicle collision and resulting WAD can demonstrate those who have poorer expectations. Appropriate treatments could theoretically modify expectations when these associated factors are amenable to change (e.g. treatment of depressive symptoms). These clinically relevant predictive factors can be easily assessed using valid and reliable measures as well as with questions having appropriate face validity (crash or income related questions for example). Negative expectations delay global recovery and/or return to work therefore it becomes important to identify these individuals early on post vehicle collision. Studies have demonstrated that those having positive global recovery expectations demonstrate over three times faster self reported recovery as those who expect they will never get better (16), and those with more positive return to work expectation are less likely to be receiving wage replacement at 6 months (37).

Secondly, the substantial impact of neck/shoulder pain on negative global recovery and return to work expectation can alert clinicians to provide appropriate interventions to alter this state, thereby reducing the potential of prolonged recovery/return to work. Despite the fact that the course of recovery from WAD and for neck pain in the general population/workers is remarkably similar (29), whiplash injuries carry the reputation of leading to a poor prognosis and leading to chronic symptoms (38). Providing early education and reassurance from health professionals regarding clinical course can be done, with one study showing that these interventions are beneficial for WAD patients, likely by modifying patient expectations (33).

Our identification of associated factors adds to the model proposed by Janzen et al. for how health expectations are formulated, affirming that factors arising from the precipitating phenomenon (such as pain), and influences on cognitive processing (such as depressive symptoms) affect the outcome (such as global recovery and return to work expectation). Future research is needed to assess the impact of and individuals' prior understanding of an event, and the potential of time varying components of expectations over the course of recovery/return to work process as well as whether there are several 'components' to recovery/return to work expectations for WAD. Testing this preliminary expectancy formulation model using such questions should increase understanding of expectancy and further uncover how to take full advantage of this influential factor for improving health outcomes.

References

(1) Holm LW, Carroll LJ, Cassidy JD, Hogg-Johnson S, Cote P, Guzman J, et al. The burden and determinants of neck pain in whiplash-associated disorders after traffic collisions: results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. Spine 2008 Feb 15;33(4 Suppl):S52-9.

(2) Cote P, Cassidy JD, Carroll L, Frank JW, Bombardier C. A systematic review of the prognosis of acute whiplash and a new conceptual framework to synthesize the literature. Spine 2001 Oct 1;26(19):E445-58.

(3) Mondloch MV, Cole DC, Frank JW. Does how you do depend on how you think you'll do? A systematic review of the evidence for a relation between patients' recovery expectations and health outcomes. CMAJ 2001 Jul 24;165(2):174-179.

(4) Cote P, Cassidy JD, Carroll LJ. Is a lifetime history of neck injury in a traffic collision associated with prevalent neck pain, headache and depressive symptomatology. Accid Anal Prev 2000;32:151-59.

(5) Cole DC, Mondloch MV, Hogg-Johnson S, Early Claimant Cohort Prognostic Modelling Group. Listening to injured workers: how recovery expectations predict outcomes--a prospective study. CMAJ 2002 Mar 19;166(6):749-754.

(6) Dasinger LK, Krause N, Deegan LJ, Brand RJ, Rudolph L. Duration of work disability after low back injury: a comparison of administrative and self-reported outcomes. Am.J.Ind.Med. 1999 Jun;35(6):619-631.

(7) Krause N, Dasinger LK, Deegan LJ, Brand RJ, Rudolph L. Alternative approaches for measuring duration of work disability after low back injury based on administrative workers' compensation data. Am.J.Ind.Med. 1999 Jun;35(6):604-618.

(8) Schultz IZ, Crook JM, Berkowitz J, Meloche GR, Milner R, Zuberbier OA, et al. Biopsychosocial multivariate predictive model of occupational low back disability. Spine 2002 Dec 1;27(23):2720-2725.

(9) Kapoor S, Shaw WS, Pransky G, Patterson W. Initial patient and clinician expectations of return to work after acute onset of work-related low back pain. J.Occup.Environ.Med. 2006 Nov;48(11):1173-1180.

(10) Jensen MP, Turner JA, Romano JM, Karoly P. Coping with chronic pain: a critical review of the literature. Pain 1991;47:249-83.

(11) Margolis RB, Tait RC, Krause SJ. A rating system for use with patient drawings. Pain 1986;24:57-65.

(12) Radloff LS. The CES-D Scale: a self-report depression scale for research in the general population. Appl Psychol Meas 1977;1:385-401.

(13) Orme JG, Reis J, Herz EJ. Factorial and discriminant validity of the Center for Epidemiological Studies Depression (CES-D) scale. J.Clin.Psychol. 1986 Jan;42(1):28-33.

(14) Carroll LJ, Cassidy JD, Cote P. The role of pain coping strategies in prognosis after whiplash injury: passive coping predicts slowed recovery. Pain 2006 Sep;124(1-2):18-26.

(15) Schulberg HC, Saul M, McClelland M, Ganguli M, Christy W, Frank R. Assessing depression in primary medical and psychiatric practices. Arch.Gen.Psychiatry 1985 Dec;42(12):1164-1170.

(16) Carroll, LJ. Holm, L. Ferrari R. Positive expectations predict faster recover in whiplash-associated disorders. 2008.

(17) Cassidy JD, Carroll LJ, Cote P, Frank J. Does multidisciplinary rehabilitation benefit whiplash recovery?: results of a population-based incidence cohort study. Spine 2007 Jan 1;32(1):126-131.

(18) Jamison RN, Parris WC, Maxson WS. Psychological factors influencing recovery from outpatient surgery. Behav Res Ther 1987;25:31-7.

(19) D. Gross, personal communication. March 13, 2007.

(20) Tarasuk V, Eakin JM. Back problems are for life: perceived vulnerability and its implications for chronic disability. Journal of Occupational Rehabilitation 1994;4(4):55-64.

(21) Sandstrom J, Esbjornsson E. Return to work after rehabilitation. The significance of the patient's own prediction. Scand.J.Rehabil.Med. 1986;18(1):29-33.

(22) Collins SL, Moore RA, McQuay HJ. The visual analogue pain intensity scale: what is moderate pain in millimetres? Pain 1997 Aug;72(1-2):95-97.

(23) SPSS Inc. SPSS For Windows. 2004;16.0.

(24) Cohen S, Herbert TB. Health psychology: psychological factors and physical disease from the perspective of human psychoneuroimmunology [review]. Annu Rev Psychol 1996;47:113-42.

(25) Lackner JM, Carosella AM, Fuerstein M. Pain expectancies, pain, and functional self-efficacy expectancies as dterminants of disability in patients with chronic low back disorders. Journal of Consulting and Clinical Psychology 1996;64:212-220.

(26) Janzen JA, Silvius J, Jacobs S, Slaughter S, Dalziel W, Drummond N. What is a health expectation? Developing a pragmatic conceptual model from psychological theory. Health Expect. 2006 Mar;9(1):37-48.

(27) Beaton DE, Tarasuk V, Katz JN, Wright JG, Bombardier C. "Are you better?" A qualitative study of the meaning of recovery. Arthritis Rheum. 2001 Jun;45(3):270-279.

(28) Ottosson C, Pettersson H, Johansson SE, Nyren O, Ponzer S. Recovered? Association between self-perceived recovery and the SF-36 after minor musculoskeletal injuries. Qual.Life Res. 2007 Mar;16(2):217-226.

(29) Carroll LJ, Holm LW, Hogg-Johnson S, Cote P, Cassidy JD, Haldeman S, et al. Course and prognostic factors for neck pain in whiplash-associated disorders (WAD): results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. Spine 2008 Feb 15;33(4 Suppl):S83-92.

(30) MacDonald S., MacIntyre P. The generic job satisfaction scale: scale development and its correlates. Employee Assistance Quarterly 1997;13(2):1-16.

(31) Gross DP, Battie MC. Work-related recovery expectations and the prognosis of chronic low back pain within a Workers' Compensation setting. JOEM 2005;47(4):428-433.

(32) Iles RA, Davidson M, Taylor NF. A systematic review of psychosocial predictors of failure to return to work in non-chronic non-specific low back pain. Occup.Environ.Med. 2008 Apr 16.

(33) Brison RJ, Hartling L, Dostaler S, Leger A, Rowe BH, Stiell I, et al. A randomized controlled trial of an educational intervention to prevent the chronic pain of whiplash associated disorders following rear-end motor vehicle collisions. Spine 2005 Aug 15;30(16):1799-1807.

(34) Mancuso CA, Graziano S, Briskie LM, Peterson MG, Pellicci PM, Salvati EA, et al. Randomized trials to modify patients' preoperative expectations of hip and knee arthroplasties. Clin.Orthop.Relat.Res. 2008 Feb;466(2):424-431.

(35) Ozegovic D, Carroll LJ, Cassidy DJ. The relationship between return to work expectation and global recovery: a population based cohort study.

(36) Venkataramanan V, Gignac MA, Mahomed NN, Davis AM. Expectations of recovery from revision knee replacement. Arthritis Rheum. 2006 Apr 15;55(2):314-321.

(37) Turner JA, Franklin G, Fulton-Kehoe D, Sheppard L, Wickizer TM, Wu R, et al. Worker recovery expectations and fear-avoidance predict work disability in a population-based workers' compensation back pain sample. Spine 2006 Mar 15;31(6):682-689.

(38) Ferrari R, Lang C. A cross-cultural comparison between Canada and Germany of symptom expectation for whiplash injury. J.Spinal.Disord.Tech. 2005 Feb;18(1):92-97.

Chapter 4 – The Relationship Between Expectations to Return to Work and Global Recovery

Study Summary

Background: Positive expectations predict better outcomes for of health conditions including recovery from WAD, but to date the relationship between positive return to work expectation and time to self reported recovery has not been studied. This becomes an important question due to the fact that some authors use return to work as a surrogate measure of recovery despite limited empirical knowledge whether a relationship between the two exists.

Methods: We assessed early expectations for return to work in a cohort of 2,335 individuals with traffic-related whiplash injuries in Saskatchewan, Canada; a province with a single, province-wide motor vehicle insurer (SGI). Using multivariable Cox proportional hazard analysis we assessed the association between return to work expectations and self-perceived recovery over a one-year period following the injury.

Findings: After controlling for the effects of sociodemographic characteristics, injury severity, prior health status and collision related factors, those who expected to return to work recovered 42% more quickly than those who did not expect to return to work or did not know (HRR=1.42, 95% CI 1.26-1.60). Depressive symptomatology, health month prior to collision, numerical rating for neck/shoulder pain at baseline, and percentage of body in pain at baseline were identified as confounders to this relationship (crude HRR=1.79, 95% CI 1.60-2.00).

Interpretation: The independent contribution of return to work expectation on health outcomes provides an important prognostic tool to clinicians evaluating their patients as well as lending a practical application to stakeholders. Knowledge of which prognostic factors contribute to recovery from soft tissue injuries is still lacking, but our findings have demonstrated that expectation to return to work correlates to actual global recovery within a WAD population. The current study outlines a prognostic factor, expectation to return to work, that can be used (via use of a simple question) to reduce the impact on individual disability and burden on the health care/insurance systems.

4.1 Introduction

The public health significance for neck pain cannot be denied with prevalence estimates between 30-50% of the adult population per year (1). Whiplash injury, a source of neck pain, is a common and costly problem in developed countries, and is an important cause of chronic disability (2-4). Moreover, whiplash carries the reputation of being a disabling and incurable condition (5), constituting not only a major medical problem but placing a major burden on the health care systems and economies of industrialized countries (6).

Of particular importance to the injured person and health/insurance systems are health recovery and return to work, which are important outcome measures for whiplash associated disorders (WAD). The concept of recovery may hold different meanings amongst individuals, and as such, the lack of a uniform definition for recovery necessitates use of alternative indices to assess the clinical course. While recovery and return to work are not identical constructs, they share similarities, with return to work used as a surrogate measure of recovery in some instances (7). Return to work and time to claim closure are used as indices of recovery in insurance systems, and used to analyze the course of recovery. This may not reflect other aspects of recovery, as it may underestimate the true duration of disability since some individuals can return to work prior to feeling like they are 'recovered' (8-10). Other researchers have used self-assessment tools which ask individuals to describe their perceived recovery. Carroll et al. (11) have found that expectation to recover is a strong predictor of global recovery following whiplash injury using a categorical variable for self-assessed recovery, and a recent systematic review (30) reports that there is strong evidence that recovery expectation appears to be one of the most consistent predictors of work disability across studies of low back pain (12-15). What remains uncertain is whether those who expect to return to work also 'recover' more quickly than those who do not expect to return to work.

The study objective was to examine the association between positive return to work expectation and global recovery (to those who do not have a positive expectation of returning to work) following a traffic collision and resulting whiplash injury. It is hypothesized that those who have a positive expectation for return to work will have a recovery rate that is faster than those who do not.

The study design is a longitudinal analysis of baseline information from a large, prospective population-based cohort study. Because the outcome of interest is time to self reported recovery, follow up data at six weeks, three, six, nine and twelve months are used to ascertain the outcome.

4.2 Study Population and Data Collection

The study included all eligible traffic-injury claimants in Saskatchewan, Canada. Complete ascertainment of claimants was possible because Saskatchewan has a single traffic-injury insurer, Saskatchewan Government Insurance (SGI); and persons seeking health care for traffic injuries are required to make a claim with SGI. At the time of this study, the insurance system was a "no fault" system, which means that insurance benefits (e.g., payment for treatment, income replacement benefits, etc.) are available to the injured individual regardless of fault for the collision. Thus, the cohort was able to capture all individuals involved in a collision who required treatment, income replacement, or other benefits.

All eligible injury insurance claimants completed the Application for Benefits form, which formed the baseline questionnaire, within 42 days of the collision. This questionnaire provided information on demographic and socioeconomic characteristics, data on the crash, injury-related symptoms, work status, expectations for recovery and for return to work, and psychological mood. All data used in the current study are self-reports from this baseline questionnaire.

All data were self reported on the insurance application form and included data on pre-injury health, demographic and socio-economic characteristics, pain intensity and location, post-injury symptoms and depressive symptomatology. After providing consent, participants were contacted via structured telephone interviews at six weeks, three, six, nine and twelve months. Questions at follow-up included self-rated global recovery.

4.3 Inclusion and Exclusion Criteria

Inclusion criteria to the study were as follows: Saskatchewan residents aged 18 and over, whose whiplash injuries were sustained between December 1, 1997 and November 30, 1999 and had made their claim within 42 days of the collision. Whiplash injuries were determined by a response of "yes" to the question, "Did the accident cause neck or shoulder pain?"; being injured in a motor vehicle (rather than as a pedestrian or bicyclist); and not being hospitalized for more than two days (which suggests injuries more serious than a whiplash injury). Excluded from this cohort were those who sustained a traffic injury at work (thereby claiming under the Workers' Compensation system, rather than SGI), those who died in the collision; those with severe injuries that precluded completing the questionnaire (for example, severe brain injury or coma); those with insufficient command of the English language to complete the questionnaire; and those with serious illness that preceded the traffic injury (e.g., Alzheimer's disease) which precluded completion of the questionnaire. Thus, the current study included only those who sustained WAD type injuries from their vehicle collision and completed their baseline questionnaire.

A sub-cohort of previously working claimants was necessary to assess return to work expectations. Inclusion to the return to work expectation cohort included those individuals who were employed at the time of the collision, but had their job change or those who reported being off work (assessed by the question "Were you off work due to the accident?" and "How many days have you been off work so far?") and were still off work at the time of completing the baseline questionnaire (assessed by the question "Are you still off work due to the accident?"). Only individuals answering "yes" to these questions became part of the cohort.

4.4 Exposure

The independent variable of interest is self-assessed expectation to return to work, included as a single question in the Application for Benefits form, which comprised part of the baseline questionnaire. A single statement was used to assess recovery expectation with the question, "Do you think that you will recover enough to return to your usual job,": yes; no; don't know? The use of this question to assess expectation to return to work has been performed in previous studies (7,16).

4.5 Outcome

Time to recovery was the primary outcome of interest. This was assessed in the follow-up interviews at six weeks, and at three, six, nine and twelve months by the question "How well do you feel you are recovering from your injuries? Are you …all better (cured)? …feeling quite a bit of improvement? …feeling some improvement? …feeling no improvement? …getting a little worse? …getting much worse?" Participants were defined as recovered when they reported feeling "all better (cured)" or "feeling quite a bit of improvement" with no recurrence. Recurrence was defined by reports of worsening symptoms in the subsequent follow-up in those who stated that they were "all better" or had experienced "quite a bit of improvement". This global self-assessment of recovery is consistent with research emphasizing the importance of using patient-centered perspectives in assessing 'recovery' in injuries (17), and has previously been performed in a study of this cohort (18).

4.6 Potential Confounders

Potential confounders were measured at baseline on the claim form and included age; gender; level of education; marital status; income level; percentage of body in pain; numerical rating scale for neck/shoulder pain; collision related headache or lower back symptoms; prior history of neck pain; prior history of musculoskeletal problems; job satisfaction; employment status (part-time, full-time, etc.); depressive symptomatology; direction of impact; position in vehicle; current health; number of days from collision to completing claim form; and health month prior to collision.

Pain intensity was measured using an 11-point numerical rating scale (responses ranging from 0 or no pain to 10 or pain as bad as could be). Individuals were asked to rate their average neck or shoulder pain on the scale. Pain location and extent was measured on a pain drawing (an anatomical diagram of anterior and posterior views of the body), on which the individual was to shade in painful areas. Percentage of body in pain was then calculated from this. Both methods have been validated and accepted as useful tools for pain measurement (19,20).

Depressive symptomatology was assessed using the Center for Epidemiologic Studies Depression Scale (CES-D) (21). The CES-D was developed for use in studies of the epidemiology of depressive symptomatology in the general population. Items were selected from previously validated scales and cover the major components of depressive symptomatology. Twenty questions are each scored from 0-3 for a possible range of scores between 0 and 60. A total score of greater than 15 indicates presence of depressive symptomatology.

General health was measured using one item from the Short Form 36 (SF-36) with the following question: "How was your health the month before the accident?" and for current health, "In general, would you say your health is now?" with the response options being: "excellent; very good; good; fair; poor". The responses were categorized as "good to excellent" or "fair/poor" for the purposes of the analysis, providing improved precision of estimates.

Socioeconomic related variables were assessed by self-report of the applicant. Questions regarding other variables such as work and crash related factors were deemed to have appropriate face validity to capture the particular domain of interest. The use of a single questions to assess these constructs has been has been used in previous studies (11,22).

4.7 Analysis

Cox proportional hazards analyses were used to assess the association between the expectations to return to work, and time-to-recovery. This was reported as a hazard rate ratio and 95% confidence intervals. The proportionality assumption of expectations was checked by plotting a log-log plot. Visual inspection confirmed the relationship between return to work expectation and recovery did not vary over time. To analyze the data, first, a crude model was built using only the return to work expectations variable. Then, bivariate models were built to identify confounders. A factor was considered a confounder if including it produced a change of 10% or greater in the estimate (the beta coefficient) of the association between expectation to return to work and time-to-recovery. Interactions between expectations and (1) pain extent; (2) pain intensity; (3) depressive symptomatology; and (4) current health were assessed, since there is some theoretical reason to think these might be effect modifiers of the exposure. A final model that adjusted for confounders was built and the hazard rate ratio reported (adjusted hazard rate ratio). The proportionality assumption of the adjusted model was again was checked using the log-log plot of the survival function.

The variable 'expectation to return to work' was dichotomized because this cohort was relatively small, and the number of persons reporting that they did not expect to return to work was low (n = 42), which would have lead to very poor precision in the estimates. Justification for combining the "no" and the "don't know" group was twofold: First of all, the time to self-reported recovery was almost identical for those persons who did not anticipate returning to their usual employment, and those who did not know whether they would return to their usual employment. Secondly, personal and injury related characteristics were similar between these two groups.

Subjects were followed until they met the criteria for recovery, or to the end of the study period. Assuming that attrition occurred randomly between each follow up period, those who dropped out of the study prior to having recovered were censored half way between the last participation point and the next scheduled interview. All analyses were completed using SPSS for Windows, version 16.0 (23).

4.8 Results

The cohort was determined by those who were employed at the time of the collision, but had their job change (assessed by the question “are you working reduced hours or modified/different duties because of the accident?”), or those who reported being off work (assessed by the question “were you off work due to the accident?” and “how many days have you been off work so far?” and “are you still off work due to the accident”). In total, of 6021 WAD claims 2335 individuals met these inclusion criteria. The descriptive characteristics of this group are outlined in Table 1.

Table 1 - Characteristics of Cohort Stratified by Return to Work Expectation at Baseline (Post-injury) (N=2335)

Factor	No or Don't Know (N=795)	Yes (N=1540)
Age (years) [n(%)]		
< 24	175 (22.0)	333 (21.6)
24-<30	133 (16.7)	232 (15.1)
30-<40	211 (26.5)	394 (25.6)
40-<50	143 (18.0)	338 (21.9)
50 or more	133 (16.7)	243 (15.8)
Marital Status [n(%)]		
Married/common-law	402 (50.6)	702 (45.6)
Not married/common-law	392 (49.4)	837 (54.4)
Number of Dependents [n(%)]		
0	443 (55.7)	885 (57.5)
1-2	258 (32.5)	482 (31.3)
3 or more	94 (11.8)	173 (11.2)
Education [n(%)]		
Less than high school	212 (26.7)	305 (19.8)
High school graduate	228 (28.7)	389 (25.3)
More than high school	354 (44.6)	843 (54.8)
Income [n(%)]		
\$0 – \$20,000	254 (32.6)	389 (25.7)
\$20,001 - \$40,000	272 (34.9)	501 (33.1)
>\$40,000	254 (32.6)	622 (41.1)
Gender [n(%)]		
Female	435 (54.7)	960 (62.3)
Male	360 (45.3)	580 (37.7)
Health Month Prior [n(%)]		
Fair or poor health	42 (5.3)	57 (3.7)
Good to excellent health	752 (94.7)	1483 (96.3)
Baseline Depressive Symptoms† [n(%)]		
Yes	526 (68.8)	752 (50.0)
No	238 (31.2)	751 (50.0)
Headache or Back Pain [n(%)]		
Moderate or greater pain	718 (91.3)	245 (16.0)
Less than moderate pain	68 (8.7)	1287 (84.0)
Previous Neck Injury [n(%)]		
Yes	215 (27.2)	403 (26.3)
No	575 (72.8)	1129 (73.7)
Previous Musculoskeletal Problems [n(%)]		
No to mild effect	174 (21.9)	386 (25.1)
Moderate to severe effect	88 (11.1)	148 (9.6)
Absent	532 (67.0)	1003 (65.3)
# Days to Completing Form* mean (SD)	12.6 (8.9)	11.8 (8.5)
Percent Body Pain* mean (SD)‡	29.3 (17.5)	25.0 (15.9)
Neck/shoulder Pain* mean (SD)§	7.42 (1.82)	6.63 (1.99)

† Yes refers to a CES-D score ≥ 16; No refers to a CES-D score < 16.

§ Neck/shoulder pain was measured on an 11-point NRS.

‡ Percentage of body in pain was assessed with a pain drawing.

Most (66.0% or 1540 subjects) of the cohort felt that they would get well enough to return to their usual job, while 32.2% (753 subjects) were unsure and 1.8% (42 subjects) felt that they would not return to their usual job. Those who responded "no or don't know" had a higher proportion of having less than high school education, were male, had depressive symptomatology at baseline, and had higher average levels of headache or back pain due to the collision. Self-reported recovery was observed in 1556 (64.5%) individuals, while 662 (27.5%) were censored before they achieved the event (self-reported recovery). Missing data were observed for 76 (3.2%) subjects where self reported time to recover data were not available for all follow-up periods, and 117 (4.9%) subjects were censored before the first 6 week follow up period (that is, they did not participate in any of the follow-up interviews).

Four factors met the criteria reported above for confounding. These were percentage of body in pain after collision, neck/shoulder pain intensity, depressive symptomatology, and current self-reported health at baseline. After adjusting for these confounders and in comparison with the reference category (those responding "no" or "don't know" for the return to work question) those who expected to return to work recovered at a rate that was 42% faster (Table 2). As a sensitivity check, a model that included all possible confounders (listed in the Methods section) was also built, but this did not appreciably change the estimates.

Interactions were assessed between the confounding factors and the exposure variable, the results of which are reported in Appendix 3. Although two of the tested interactions, percentage of body in pain and depressive symptomatology, were statistically significant in crude models which include each of the main effect with the relevant interaction term, the effect sizes were small in magnitude. The effect size of the interaction term of return to work expectation and the percent of body in pain variable was only HRR = 1.01. In order to enhance interpretability, the judgment was made to leave out that interaction term and to consider percentage of body in pain to be a confounder. The interaction term between expectations for return to work and depression had a somewhat greater effect size (HRR=1.29), and to examine the importance of depression as an effect modifier of expectations, two separate adjusted models were built (one model for depressed persons, one model for non-depressed persons). These are reported in Appendix 3. Because the adjusted effect sizes of expectations to return to work were in the same direction, were similar (HRR = 1.29 vs. HRR = 1.58), and the confidence intervals of these two models were wide, the judgment was made to view depression as a confounder rather than an effect modifier. This decision was made in order to simplify interpretability of the findings. However, the adjusted models of the independent associations between expectations for return to work and self-reported recovery for depressed and for non-depressed claimants are reported in Appendix 3.

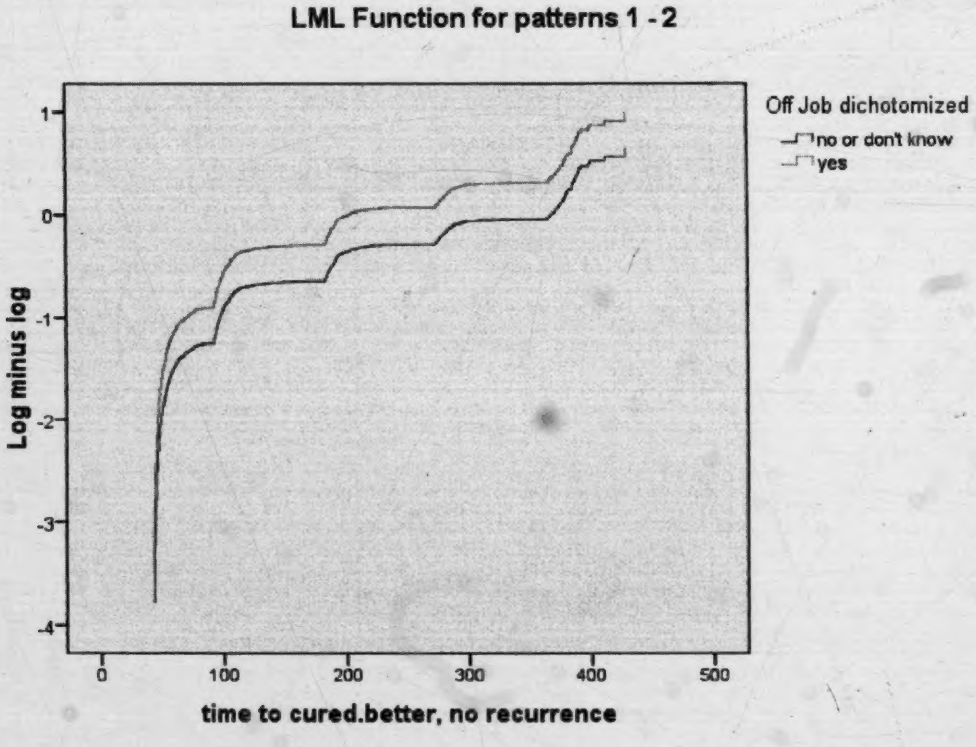
Table 2 – The Strength of Association Between Positive Return to Work Expectation and Time to Recover

Exposure	Crude HR (95% CI)	Adjusted HR (95% CI)
Return To Work Expectation		
Yes	1.79 (1.60-2.00)	1.42* (1.26-1.60)
No or Don't Know	1.00	1.00

*Adjusted for the following confounders: CES-D score at baseline, self assessed health month prior to collision, numerical rating for neck/shoulder pain at baseline and percentage of body in pain at baseline

The log minus log plots to test the proportionality assumption of expectations in the adjusted model are reported in Figure 1.

Figure 1 – Log-log Plot of the adjusted association between return to work expectations and self-rated recovery.



4.9 Discussion

Our study results support the idea that expectation to return to work is not simply an indirect measure of other factors but has an influence, either directly or as a mediating variable, on the recovery process, although these data cannot distinguish these two modes of association. Those who had a positive return to work expectation had a 42% faster rate in achieving the index of recovery (self-reported recovery with no recurrence of symptoms), after adjusting for confounding factors. These results parallel the findings of others with regards to global recovery (11) and return to work expectation (7,12,13,15). While our cohort excluded those with work related compensation claims, our population based sample, and sub-cohort of those working at the time of the collision would likely have similar recovery rates as this population. As claims due to neck pain are prevalent (24), and the fact that recovery from whiplash injuries is a prolonged process for many (18,25-27), factors that influence recovery become important particularly if these factors are amenable to change. A recent expert consensus panel believed that expectations are likely amenable to change (28). Also, a recent study has postulated that reduction of WAD symptoms via reassurance and educational interventions occurs through changing of expectations (29).

Others have supported the idea that expectations combine variables across multiple constructs that would be too numerous or difficult to measure individually, but low expectations of individuals could cue health care practitioners to further explore which psychosocial factors may need to be addressed to facilitate positive recovery or return to work expectations (30). Findings from qualitative research have demonstrated the major domains of job/financial security, re-injury, workplace support and self image as important themes for return to work expectation for low back pain patients (31), and similar themes may be found for those with WAD symptoms.

Janzen et al. have proposed a model of health expectation which supports the idea of previous experience with similar events, knowledge and beliefs of the event and recovery are all important factors in forming an expectation (32). Given that some in the general public feel whiplash injuries have a poor prognosis and frequently lead to chronic symptoms (5), modification of these beliefs could improve expectation for return to work, and thus recovery. Our findings suggest the idea that improving return to work expectation improves the rate of self-reported recovery, although this would have to be tested in randomized controlled trials.

The independent contribution of return to work expectation on health outcomes provides an important prognostic tool to clinicians evaluating their patients and also lends a practical application to other stakeholders interested in return to work. Knowledge of which prognostic factors contribute to recovery from soft tissue injuries is still lacking, but our findings have demonstrated that expectation to return to work correlates to actual global recovery within a WAD population. The current study outlines a prognostic factor, expectation to return to work, that can be used to reduce the impact on individual disability, and burden on the health care/insurance systems.

One method by which return to work expectation might be improved is the offer of alternate workplace arrangements. Hogg-Johnson et al. show that workplace offers of arrangement for return to work (such as flexible working hours or modified or altered duties) contributed to a model predicting duration on temporary total benefits in the first year among workers with compensated occupational soft tissue injuries. Those who were provided with alternate duties had fewer days of time on benefits regardless of change in pain grade, or reported functional status at 4 weeks post injury onset (33). If those with uncertain return to work expectation are accommodated early with respect to return to work, this may facilitate more positive expectancies and reduce disability perceptions of these workers. These recommendations are in keeping with themes uncovered in qualitative work mentioned previously (31).

4.10 Strengths of Analyses

An important strength of the study is the use of a prospective cohort (with clear inclusion/exclusion criteria) with time to event data with ascertainment of all eligible persons over the study time period. This eliminates potential for selection bias as the entire population was included within the study. The excellent follow up information and large study population enrolled provides strong evidence regarding the relation between return to work expectation and self-reported recovery according to quality criteria for prognostic studies (34).

Missing information and loss to follow up was low in our study and constituted less than twelve percent of the study population for the analyses for the relationship between return to work expectation and self reported recovery (11.8%). Missing data usually pertained to CES-D scores, income, and numerical rating for neck/shoulder pain following the vehicle collision.

A broad range of demographic, social, work, psychological and crash-related factors were examined in the baseline application form, and could be considered as potential confounding variables. The baseline data were available from insurance claims forms, so we have near complete information for all of our factors, and those factors with missing information constituted less than four percent (3.2%) of our sample. Measurement of important variables such as depressive symptoms was done using a valid, reliable instrument, the CES-D. Other variable questions appeared to have good face validity to assess the construct intended, or were modeled from previous studies using the same or similar questions.

4.11 Potential Biases/Limitations

The assessment of expectations may be biased by response time. Since subjects had 6 weeks to respond to the baseline questionnaire, those who respond early following the event may be more likely to be unsure of how they will recover resulting in underestimation of outcome, or those with few symptoms initially may overestimate their expectation to return to work but may develop increased symptoms at a later date. The questionnaire form provided a "don't know" answer to this question. Our analysis accounted for this variable. Response time bias was also accounted for by examining the time between the collision and completing the claim form as a confounder in a bivariate analysis. This did not demonstrate any appreciable change in the relationship between return to work expectation and time to recovery.

4.12 Conclusion

Knowledge of an individual's return to work expectation is informative to their actual course of recovery. Those who had a positive expectation to return to work had a 42% faster rate of self-reported recovery without recurrence compared to those who did not have a positive expectation to return to work. This informative prognostic factor is easily assessed, has clinical as well as economic utility, and could potentially be amenable to change as demonstrated by a previous study. Future research focused on timing of expectation questions, how interventions can alter return to work expectations, and whether more precise work related factors (e.g. co-worker relations, self autonomy at work) can alter return to work expectations would be useful.

References

(1) Hogg-Johnson S, van der Velde G, Carroll LJ, Holm LW, Cassidy JD, Guzman J, et al. The burden and determinants of neck pain in the general population: results of the Bone and Joint Decade 2000-2010 Task Force on Neck Pain and Its Associated Disorders. Spine 2008 Feb 15;33(4 Suppl):S39-51.

(2) Cote P, Cassidy JD, Carroll L, Frank JW, Bombardier C. A systematic review of the prognosis of acute whiplash and a new conceptual framework to synthesize the literature. Spine 2001 Oct 1;26(19):E445-58.

(3) Sterling M, Jull G, Vicenzino B, Kenardy J, Darnell R. Physical and psychological factors predict outcome following whiplash injury. Pain 2005;114(141-8).

(4) Sterling M, Jull G, Kenardy J. Physical and psychological factors maintain long-term predictive capacity post-whiplash injury. Pain 2006;122:102-108.

(5) Ferrari R, Lang C. A cross-cultural comparison between Canada and Germany of symptom expectation for whiplash injury. J.Spinal.Disord.Tech. 2005 Feb;18(1):92-97.

(6) Hendriks EJ, Scholten-Peeters GG, van der Windt DA, Neeleman-van der Steen CW, Oostendorp RA, Verhagen AP. Prognostic factors for poor recovery in acute whiplash patients. Pain 2005 Apr;114(3):408-416.

(7) Cole DC, Mondloch MV, Hogg-Johnson S, Early Claimant Cohort Prognostic Modelling Group. Listening to injured workers: how recovery expectations predict outcomes--a prospective study. CMAJ 2002 Mar 19;166(6):749-754.

(8) Gross DP, Battie MC. Work-related recovery expectations and the prognosis of chronic low back pain within a Workers' Compensation setting. JOEM 2005;47(4):428-433.

(9) Dasinger LK, Krause N, Deegan LJ, Brand RJ, Rudolph L. Duration of work disability after low back injury: a comparison of administrative and self-reported outcomes. Am.J.Ind.Med. 1999 Jun;35(6):619-631.

(10) Krause N, Dasinger LK, Deegan LJ, Brand RJ, Rudolph L. Alternative approaches for measuring duration of work disability after low back injury based on administrative workers' compensation data. Am.J.Ind.Med. 1999 Jun;35(6):604-618.

(11) Carroll, LJ. Holm, L. Ferrari R. Positive expectations predict faster recover in whiplash-associated disorders. 2008.

(12) Dionne CE, Bourbonnais R, Fremont P, Rossignol M, Stock SR, Larocque I. A clinical return-to-work rule for patients with back pain. CMAJ 2005 Jun 7;172(12):1559-1567.

(13) Hagen EM, Svensen E, Eriksen HR. Predictors and modifiers of treatment effect influencing sick leave in subacute low back pain patients. Spine 2005 Dec 15;30(24):2717-2723.

(14) Karjalainen K, Malmivaara A, Mutanen P, Pohjolainen T, Roine R, Hurri H. Outcome determinants of subacute low back pain. Spine 2003 Dec 1;28(23):2634-2640.

(15) Turner JA, Franklin G, Fulton-Kehoe D, Sheppard L, Wickizer TM, Wu R, et al. Worker recovery expectations and fear-avoidance predict work disability in a population-based workers' compensation back pain sample. Spine 2006 Mar 15;31(6):682-689.

(16) Sandstrom J, Esbjornsson E. Return to work after rehabilitation. The significance of the patient's own prediction. Scand.J.Rehabil.Med. 1986;18(1):29-33.

(17) Beaton DE, Tarasuk V, Katz JN, Wright JG, Bombardier C. "Are you better?" A qualitative study of the meaning of recovery. Arthritis Rheum. 2001 Jun;45(3):270-279.

(18) Cassidy JD, Carroll LJ, Cote P, Frank J. Does multidisciplinary rehabilitation benefit whiplash recovery?: results of a population-based incidence cohort study. Spine 2007 Jan 1;32(1):126-131.

(19) Jensen MP, Turner JA, Romano JM, Karoly P. Coping with chronic pain: a critical review of the literature. Pain 1991;47:249-83.

(20) Margolis RB, Tait RC, Krause SJ. A rating system for use with patient drawings. Pain 1986;24:57-65.

(21) Radloff LS. The CES-D Scale: a self-report depression scale for research in the general population. Appl Psychol Meas 1977;1:385-401.

(22) Carroll LJ, Cassidy JD, Cote P. The role of pain coping strategies in prognosis after whiplash injury: passive coping predicts slowed recovery. Pain 2006 Sep;124(1-2):18-26.

(23) SPSS Inc. SPSS For Windows. 2004;16.0.

(24) Cote P, Kristman V, Vidmar M, Van Eerd D, Hogg-Johnson S, Beaton D, et al. The prevalence and incidence of work absenteeism involving neck pain: a cohort of Ontario lost-time claimants. Spine 2008 Feb 15;33(4 Suppl):S192-8.

(25) Cassidy JD, Carroll LJ, Cote P, Lemstra M, Berglund A, Nygren A. Effect of eliminating compensation for pain and suffering on the outcome of insurance claims for whiplash injury. N.Engl.J.Med. 2000 Apr 20;342(16):1179-1186.

(26) Berglund A, Bodin L, Jensen I, Wiklund A, Alfredsson L. The influence of prognostic factors on neck pain intensity, disability, anxiety and depression over a 2-year period in subjects with acute whiplash injury. Pain 2006 Dec 5;125(3):244-256.

(27) Suissa S, Harder S, Veilleux M. The relation between initial symptoms and signs and the prognosis of whiplash. Eur.Spine J. 2001 Feb;10(1):44-49.

(28) Guzman J, Hayden J, Furlan AD, Cassidy JD, Loisel P, Flannery J, et al. Key factors in back disability prevention: a consensus panel on their impact and modifiability. Spine 2007 Apr 1;32(7):807-815.

(29) Brison RJ, Hartling L, Dostaler S, Leger A, Rowe BH, Stiell I, et al. A randomized controlled trial of an educational intervention to prevent the chronic pain of whiplash associated disorders following rear-end motor vehicle collisions. Spine 2005 Aug 15;30(16):1799-1807.

(30) Iles RA, Davidson M, Taylor NF. A systematic review of psychosocial predictors of failure to return to work in non-chronic non-specific low back pain. Occup.Environ.Med. 2008 Apr 16.

(31) Shaw WS, Huang YH. Concerns and expectations about returning to work with low back pain: identifying themes from focus groups and semi-structured interviews. Disabil.Rehabil. 2005 Nov 15;27(21):1269-1281.

(32) Janzen JA, Silvius J, Jacobs S, Slaughter S, Dalziel W, Drummond N. What is a health expectation? Developing a pragmatic conceptual model from psychological theory. Health Expect. 2006 Mar;9(1):37-48.

(33) Hogg-Johnson S, Cole DC. Early prognostic factors for duration on temporary total benefits in the first year among workers with compensated occupational soft tissue injuries. Occup.Environ.Med. 2003 Apr;60(4):244-253.

(34) Hudak PL, Cole DC, Haines AT. Understanding prognosis to improve rehabilitation: the example of lateral elbow pain. Arch.Phys.Med.Rehabil. 1996 Jun;77(6):586-593.

Chapter 5 – Conclusion: What Does It All Mean?

Recovery expectation has been shown to play a vital role within a broad range of health conditions and is an important prognostic factor for outcomes such as return to work, and recovery following surgery (1). What this dissertation attempts is to provide direction for ascertaining associated factors important for positive global recovery/return to work expectation, and show the relationship between expectation to return to work and subsequent self-assessed recovery within an employed WAD population.

Why is it important to know about these predictive factors and the relationship between return to work expectation and actual self reported recovery? Firstly, identifying factors to be associated with more positive return to work and recovery expectations becomes important because positive expectations reduce time to return to work, and time to 'recovery'. If factors that are associated with positive expectations are identified, and if they are amenable to change, they can be sources for designing interventions to maximize the ability for one to have positive expectancies, thereby minimizing the time that WAD symptoms interfere with participation with activities of daily living (work, leisure, and self care tasks).

Secondly, knowledge of what expectations patients have after vehicle collision can provide the ability to reassure or educate those who have expectations that are out of synch with available information regarding course and prognosis for recovery for WAD. Available research allows clinicians to provide background information to their patients that gives them the knowledge to inform realistic expectancies, and also to 'normalize' what patients experience day-to-day with regards to their reported symptoms. If patients realize that their WAD symptoms are not far off from what 30-50% of the general population experience without being subject to a vehicle collision, it could reduce the worry, fear or misinformation many have regarding whiplash.

Third, knowledge of an individual's return to work expectation correlates to their time to reporting 'recovery' following a vehicle collision with resulting WAD symptoms. With many research articles using outcomes such as return to work, or time on benefits as an index of recovery, our findings support the rationale that individuals who expect to return to work also 'recover' at a faster rate. Therefore, if researchers say they want to know what return to work rates are like for those with positive recovery expectations and consider this an appropriate measure of the outcome, our findings would lend some support to this. It seems that 'recovery' potentially includes return to work as a dimension of this larger construct.

We have completed two novel research projects which, to the best of our knowledge, have not previously been studied. We anticipate that our findings will be used to further contribute to the complicated puzzle of expectancies and impacts on an important public health problem – neck pain. In doing so, we have examined important biopsychosocial factors such as depression and pain, which were noted to be significant factors for having positive expectations. The importance of biopsychosocial factors in epidemiologic research provides the opportunity to further describe the complex interactions between individual risk factors, the physical/social environments for complex constructs such as recovery/return to work expectation and how these factors may impact on important health outcomes such as return to work and recovery expectation itself.

The ability to build upon existing research on expectation and WAD prognosis with a fresh approach using a biopsychosocial framework moves epidemiologic research within this arena from a "black box" approach looking only at risk factors to a potentially more "ecoepidemiologic" framework that moves to link the risk factor and social epidemiology fields. The present research provides a crucial step towards making this link, and advances the biopsychosocial framework within the study of soft tissue injuries by demonstrating the important contributions of expectancies to health outcomes, and also by recognizing how expectancies are shaped by a host of factors, all of which deserve research attention. By offering this preliminary study and background of global and return to work expectations, we hope the larger research and clinical communities are able to integrate an appreciation of the often unrecognized societal influences of cognition; how experiences of our lives shape our beliefs and provide each of us with a useful lens through which to view our world; how dynamic and multi-faceted expectation formulation is; and also how an integrated approach encompassing a variety of disciplines and views is required to understand this important construct. Recognizing these tenets, and acknowledging how little modern medicine/science has given these points attention can provide a useful starting point for further discussion.

References

(1) Mondloch MV, Cole DC, Frank JW. Does how you do depend on how you think you'll do? A systematic review of the evidence for a relation between patients' recovery expectations and health outcomes. CMAJ 2001 Jul 24;165(2):174-179.

Appendix 1 – Addition of a Trichotomous Position in Vehicle Variable

Table 1 - Crude Odds Ratios and 95% Confidence Intervals For Factors Associated With Positive Recovery Expectation

Factor	Get Better Slowly OR (95% CI) ¶	Never Get Better OR (95% CI) ¶	Don't Know OR (95% CI) ¶
Age Group (years)			
< 24	1.16 (0.94-1.42)	1.35 (0.77-2.35)	0.91 (0.74-1.14)
24-<30	1.08 (0.86-1.35)	1.03 (0.53-1.97)	0.99 (0.78-1.25)
30-<40	0.74 (0.61-0.90)*	0.86 (0.50-1.50)	0.67 (0.55-0.82)*
40-<50	0.69 (0.57-0.84)*	0.40 (0.20-0.80)*	0.68 (0.55-0.83)*
50 or more	1.00	1.00	1.00
Marital Status			
Not married/common-law	1.20 (1.06-1.37)*	3.04 (2.01-4.60)*	1.26 (1.10-1.45)*
Married/common-law	1.00	1.00	1.00
Education			
Less than high school	1.64 (1.38-1.96)*	2.38 (1.53-3.71)*	2.46 (2.05-2.95)*
High school graduate	1.14 (0.97-1.33)	0.80 (0.46-1.37)	1.50 (1.28-1.78)*
More than high school	1.00	1.00	1.00
Income (Cdn dollars)			
\$0 – \$20,000	1.70 (1.45-2.00)*	4.10 (2.46-6.84)*	2.14 (1.81-2.54)*
\$20,001 - \$40,000	1.44 (1.22-1.68)*	2.61 (1.53-4.47)*	1.76 (1.49-2.08)*
>\$40,000	1.00	1.00	1.00
Gender			
Male	0.97 (0.85-1.12)	1.22 (0.82-1.81)	1.15 (1.00-1.33)*
Female	1.00	1.00	1.00
Position in Vehicle			
Front seat passenger	1.50 (1.27-1.79)*	2.09 (1.34-3.27)*	1.62 (1.35-1.93)*
Back seat passenger	1.29 (0.92-1.83)	1.56 (0.60-4.01)	1.31 (0.91-1.88)
Driver	1.00	1.00	1.00
Direction of Impact			
Front	1.37 (1.16-1.60)*	1.44 (0.90-2.26)	1.15 (0.97-1.36)
Driver side	1.34 (1.10-1.63)*	1.02 (0.55-1.91)	1.08 (0.88-1.33)
Passenger side	1.47 (1.19-1.82)*	1.31 (0.70-2.45)	1.07 (0.85-1.34)
Other	1.62 (1.19-2.23)*	1.22 (0.47-3.19)	1.15 (0.82-1.62)
Rear	1.00	1.00	1.00
Health Month Prior			
Good to excellent health	0.92 (0.68-1.23)	0.23 (0.14-0.40)*	0.52 (0.39-0.69)*
Fair or poor health	1.00	1.00	1.00
Baseline Depressive Symptoms [n(%)]†			
Yes	2.40 (2.08-2.76)*	7.14 (4.61-11.1)*	3.46 (2.99-4.02)*
No	1.00	1.00	1.00
Headache or Back Pain			
Moderate or greater pain	2.27 (1.95-2.66)*	4.73 (2.37-9.43)*	2.85 (2.40-3.40)*
No or mild pain	1.00	1.00	1.00
Previous Neck Injury			
Yes	1.32 (1.14-1.53)*	2.52 (1.70-3.74)*	1.20 (1.03-1.41)*
No	1.00	1.00	1.00
Previous Musculoskeletal Problems			
No to mild effect	0.86 (0.74-0.99)*	1.05 (0.64-1.72)	0.76 (0.65-0.89)*
Moderate to severe	1.12 (0.91-1.38)	4.10 (2.59-6.48)*	1.35 (1.09-1.66)*
Absent	1.00	1.00	1.00
Neck/shoulder Pain§	1.27 (1.23-1.31)*	1.70 (1.52-1.90)*	1.42 (1.37-1.47)*
Percent Body Pain‡	1.03 (1.02-1.03)*	1.04 (1.03-1.05)*	1.03 (1.03-1.04)*

¶ Comparison Group is "Get Better Soon"

* Denotes significant at $p < 0.05$

† Yes refers to a CES-D score ≥ 16; No refers to a CES-D score < 16.

§ Neck/shoulder pain was measured on an 11-point NRS.

‡ Percentage of body in pain was assessed with a pain drawing.

Table 2 - Adjusted Odds Ratios and 95% Confidence Intervals For Factors Associated With Positive Recovery Expectation

Factor	Get Better Slowly¶ OR (95% CI)	Never Get Better¶ OR (95% CI)	Don't Know¶ OR (95% CI)
Age Group (years)			
< 24	1.15 (0.89-1.49)	1.34 (0.67-2.68)	0.90 (0.68-1.19)
24-<30	1.05 (0.81-1.36)	1.16 (0.54-2.46)	1.08 (0.82-1.43)
30-<40	0.74 (0.59-0.92)*	1.11 (0.58-2.11)	0.74 (0.58-0.94)*
40-<50	0.74 (0.59-0.92)*	0.40 (0.18-0.88)*	0.77 (0.61-0.98)*
50 or more	1.00	1.00	1.00
Marital Status			
Not married/common-law	0.98 (0.82-1.17)	2.71 (1.58-4.64)*	1.10 (0.91-1.33)
Married/common-law	1.00	1.00	1.00
Education			
Less than high school	1.38 (1.12-1.70)*	1.80 (1.05-3.08)*	2.11 (1.69-2.62)*
High school graduate	1.06 (0.89-1.26)	0.82 (0.46-1.47)	1.44 (1.19-1.74)*
More than high school	1.00	1.00	1.00
Income (Cdn dollars)			
$0 – $20,000	1.16 (0.94-1.42)	1.13 (0.61-2.09)	1.27 (1.01-1.58)*
$20,001 - $40,000	1.20 (1.01-1.43)*	1.37 (0.76-2.47)	1.34 (1.10-1.63)*
>$40,000	1.00	1.00	1.00
Gender			
Male	1.18 (1.01-1.38)*	1.81 (1.15-2.86)*	1.39 (1.17-1.64)*
Female	1.00	1.00	1.00
Position in vehicle			
Front seat passenger	1.54 (1.27-1.87)*	2.34 (1.40-3.92)*	1.54 (1.25-1.89)*
Back seat passenger	1.05 (0.72-1.53)	1.38 (0.51-3.77)	1.00 (0.66-1.50)
Driver	1.00	1.00	1.00
Direction of Impact			
Front	1.24 (1.04-1.48)*	1.14 (0.69-1.90)	0.92 (0.77-1.12)
Driver side	1.22 (0.99-1.52)	0.70 (0.34-1.42)	0.88 (0.69-1.11)
Passenger Side	1.22 (0.97-1.54)	0.76 (0.37-1.56)	0.77 (0.60-1.00)*
Other	1.35 (0.96-1.92)	0.88 (0.32-2.45)	0.72 (0.49-1.07)
Rear	1.00	1.00	1.00
Health Month Prior			
Good to excellent health	1.18 (0.85-1.65)	0.61 (0.32-1.18)	0.75 (0.54-1.04)
Fair or poor health	1.00	1.00	1.00
Baseline Depressive Symptoms [n(%)]†			
Yes	1.76 (1.51-2.06)*	4.23 (2.61-6.86)*	2.32 (1.96-2.74)*
No	1.00	1.00	1.00
Headache or Back Pain			
Moderate or greater pain	1.32 (1.10-1.58)*	1.51 (0.69-3.29)	1.32 (1.07-1.63)*
No or mild pain	1.00	1.00	1.00
Previous Neck Injury			
Yes	1.29 (1.10-1.53)*	1.86 (1.17-2.96)*	1.06 (0.88-1.28)
No	1.00	1.00	1.00
Previous Musculoskeletal Problems			
No to mild effect	0.89 (0.75-1.05)	1.22 (0.70-2.12)	0.81 (0.68-0.98)*
Moderate to severe	1.02 (0.81-1.30)	3.17 (1.81-5.56)*	1.05 (0.82-1.36)
Absent	1.00	1.00	1.00
Neck/shoulder Pain§	1.18 (1.14-1.23)*	1.48 (1.31-1.67)*	1.30 (1.24-1.35)*
Percent Body Pain‡	1.02 (1.01-1.02)*	1.01 (1.00-1.03)	1.02 (1.01-1.02)*

¶ Comparison Group is "Get Better Soon"

* Denotes significant at $p < 0.05$

† Yes refers to a CES-D score ≥ 16; No refers to a CES-D score < 16.

§ Neck/shoulder pain was measured on an 11-point NRS.

‡ Percentage of body in pain was assessed with a pain drawing.

Appendix 2 – Characteristics of the Group Answering "Not Applicable" to Return to Work Expectation Question

Table 1 - Characteristics of Cohort Stratified by Return to Work Expectation at Baseline (Post-injury) (N=2335)

Factor	**Not Applicable (N=71)**
Age (years) [n(%)]	
< 24	14 (19.7)
24-<30	17 (23.9)
30-<40	22 (31.0)
40-<50	11 (15.5)
50 or more	7 (9.9)
Marital Status [n(%)]	
Married/common-law	28 (39.4)
Not married/common-law	43 (60.6)
Number of Dependents [n(%)]	
0	45 (63.4)
1-2	20 (28.2)
3 or more	6 (8.5)
Education [n(%)]	
Less than high school	9 (12.7)
High school graduate	14 (19.7)
More than high school	48 (67.6)
Income [n(%)]	
$0 – $20,000	19 (27.5)
$20,001 - $40,000	25 (36.2)
>$40,000	25 (36.2)
Gender [n(%)]	
Female	53 (74.6)
Male	18 (25.4)
Health Month Prior [n(%)]	
Fair or poor health	1 (1.4)
Good to excellent health	70 (98.6)
Baseline Depressive Symptoms [n(%)]†	
Yes	34 (48.6)
No	36 (51.4)
Headache or Back Pain [n(%)]	
Moderate or greater pain	61 (85.9)
Less than moderate pain	10 (14.1)
Previous Neck Injury [n(%)]	
Yes	20 (28.6)
No	50 (71.4)
# Days to Completing Form* mean (SD)	14.2 (10.9)
Percent Body Pain* mean (SD)‡	23.2 (15.6)
Neck/shoulder Pain* mean (SD)§	4.13 (3.41)

* Denotes continuous variable

† Yes refers to a CES-D score ≥ 16; No refers to a CES-D score < 16.

§ Neck/shoulder pain was measured on an 11-point NRS.

‡ Percentage of body in pain was assessed with a pain drawing.

Appendix 3 – Assessing the Effect Modification Variables

Interaction terms were first tested in a crude model between each of the confounding factors and the main effects. Results of this analysis are listed in Table 1 for each interaction term. Those variables that achieved statistical significance were then evaluated for their clinical utility and overall impact on the relationship, resulting in the expectation*percent body pain interaction term to not be considered. Its impact as an interaction term did not meaningfully alter the strength of relationship between return to work expectation and self reported recovery and percent body pain was thus considered more important to consider as a confounder rather than in an interaction term.

Table 1 – Hazard Rate Ratios of Interaction Terms*

Interaction Terms	HRR	p-value	95% CI
Expectation*Depression	1.30	0.03	1.03-1.62
Expectation*Percent Body Pain	1.01	0.02	1.01-1.02
Expectation*Neck/shoulder Pain	1.02	0.55	0.96-1.08
Expectation*Health Now	1.08	0.22	0.95-1.23

*Significance of interaction term in a crude model containing the relevant main effects and the interaction terms

The interaction between the expectation*depression variable demonstrates statistical significance, as well as clinical meaning. Table 2 outlines the independent effect of the interaction term between the expectation variable and depression on self reported recovery. The interaction term alters the hazard rate ratio. The independent effect of the interaction term on self reported recovery was noted to be statistically significant.

Table 2 – Independent Effect of the Interaction Between Expectation and Depression on Recovery

Interaction Variable Added	Adjusted HR (95% CI)
Expectation*Depression	1.29 (1.02-1.63)

*Model containing interaction term and the following confounders: self assessed health month prior to collision, numerical rating for neck/shoulder pain at baseline and percentage of body in pain at baseline

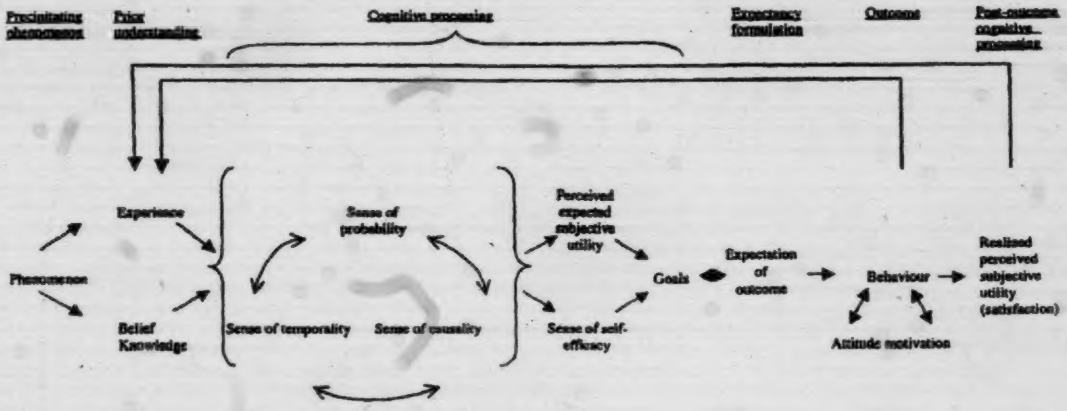
Stratification of the interaction term by presence or absence of depressive symptomatology is listed in Table 3. The independent effect of expectation for return to work stratified by depressive symptoms in the sub-cohort of those with depressive symptoms was HRR = 1.58. This means that those who had positive return to work expectation and depressive symptomatology had a 58% faster rate of self reported recovery than those who did not have positive return to work expectation. For those without depressive symptomatology, their rate of self reported recovery was 23% faster compared to those without positive return to work expectation.

Table 3 – Independent Effect of Expectations For Return to Work Stratified by Depressive Symptoms

Expectations to Return to Work	Adjusted HR (95% CI)
Depressed Sub-cohort	1.58* (1.35-1.85)
Not Depressed Sub-cohort	1.23* (1.02-1.47)

*Adjusted for the following confounders: self assessed health month prior to collision, numerical rating for neck/shoulder pain at baseline and percentage of body in pain at baseline

Appendix 4 - Conceptual Model for Expectation Development (1)


Precipitating phenomenon
Prior understanding
Cognitive processing
Expectancy formulation
Outcome
Post-outcome cognitive processing
Experience
Phenomenon
Belief Knowledge
Sense of probability
Sense of temporality
Sense of causality
Perceived expected subjective utility
Sense of self-efficacy
Goals
Expectation of outcome
Behaviour
Attitude motivation
Realized perceived subjective utility (satisfaction)

(1) Janzen JA, Silvius J, Jacobs S, Slaughter S, Dalziel W, Drummond N. What is a health expectation? Developing a pragmatic conceptual model from psychological theory. Health Expect. 2006 Mar;9(1):37-48.

Appendix 5 – Model Diagnostics for Global Recovery and Return to Work Expectation

The overall R-squared value (Cox and Snell) for the model for associated factors with global recovery expectation was 0.163. Also, the overall value for the Likelihood Ratio (LR) test statistic for the final model was 980.73 with 69 degrees of freedom and a corresponding p-value <0.001.

The overall R-squared value (Cox and Snell) for the model for associated factors with return to work expectation was 0.090. Also, the overall value for the Likelihood Ratio (LR) test statistic for the final model was 203.84 with 20 degrees of freedom and a corresponding p-value of <0.001. The Hosmer-Lemeshow Test for Goodness of Fit had a chi-square value of 10.36 with 8 degrees of freedom and a corresponding p-value of 0.24

Appendix 6 – Correlation Tables for Variables Used in the Two Research Studies

		Education recoded	Marital status recoded	Income recoded	Position in vehicle	Direction of impact	Sex	other pain	scored muscle problems	Prior neck @ SGI or other	depressed	Health month before recoded	age group
Education recoded	Correlation Coefficient	1.000	-.050**	.188**	.125**	.062**	.143**	.010	-.033*	-.039**	.067**	-.053**	-.134**
	Sig. (2-tailed)	.	.000	.000	.000	.000	.000	.429	.010	.003	.000	.000	.000
	N	6009	6007	5846	6009	5971	6009	5955	5996	5984	5821	6008	6009
Marital status recoded	Correlation Coefficient	-.050**	1.000	.468**	-.064**	.034**	-.012	.052**	-.039**	-.013	.087**	-.002	.410**
	Sig. (2-tailed)	.000	.	.000	.000	.009	.362	.000	.003	.304	.000	.856	.000
	N	6007	6019	5848	6019	5980	6019	5965	6006	5994	5827	6018	6019
Income recoded	Correlation Coefficient	.188**	.468**	1.000	.081**	.080**	-.036**	.066**	-.029*	-.019	.155**	-.055**	.227**
	Sig. (2-tailed)	.000	.000	.	.000	.000	.005	.000	.026	.150	.000	.000	.000
	N	5846	5848	5850	5850	5812	5850	5798	5838	5826	5673	5849	5850
Position in vehicle	Correlation Coefficient	.125**	-.064**	.081**	1.000	.001	-.142**	-.011	-.017	-.064**	.050**	-.043**	-.011
	Sig. (2-tailed)	.000	.000	.000	.	.922	.000	.410	.193	.000	.000	.001	.390
	N	6009	6019	5850	6021	5982	6021	5967	6008	5996	5829	6020	6021
Direction of impact	Correlation Coefficient	.062**	.034**	.080**	.001	1.000	.057**	-.022	-.027*	-.046**	.104**	.010	.078**
	Sig. (2-tailed)	.000	.009	.000	.922	.	.000	.095	.040	.000	.000	.439	.000
	N	5971	5980	5812	5982	5982	5982	5928	5969	5958	5793	5981	5982
Sex	Correlation Coefficient	.143**	-.012	-.036**	-.142**	.057**	1.000	-.051**	-.113**	-.055**	-.044**	.029*	-.019
	Sig. (2-tailed)	.000	.362	.005	.000	.000	.	.000	.000	.000	.001	.026	.140
	N	6009	6019	5850	6021	5982	6021	5967	6008	5996	5829	6020	6021
other pain	Correlation Coefficient	.010	.052**	.066**	-.011	-.022	-.051**	1.000	.031*	.098**	.181**	-.036**	.080**
	Sig. (2-tailed)	.429	.000	.000	.410	.095	.000	.	.017	.000	.000	.006	.000

	N	5955	5965	5798	5967	5928	5967	5967	5955	5943	5779	5966	5967
scored muscle problems	Correlation Coefficient	-.033*	-.039**	-.029*	-.017	-.027*	-.113**	.031*	1.000	.202**	-.026*	-.129**	-.178**
	Sig. (2-tailed)	.010	.003	.026	.193	.040	.000	.017	.	.000	.049	.000	.000
	N	5996	6006	5838	6008	5969	6008	5955	6008	5983	5817	6008	6008
Prior neck @ SGI or other	Correlation Coefficient	-.039**	-.013	-.019	-.064**	-.046**	-.055**	.098**	.202**	1.000	.002	-.119**	-.109**
	Sig. (2-tailed)	.003	.304	.150	.000	.000	.000	.000	.000	.	.861	.000	.000
	N	5984	5994	5826	5996	5958	5996	5943	5983	5996	5807	5995	5996
depressed	Correlation Coefficient	.067**	.087**	.155**	.050**	.104**	-.044**	.181**	-.026*	.002	1.000	-.067**	.046**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.001	.000	.049	.861	.	.000	.000
	N	5821	5827	5673	5829	5793	5829	5779	5817	5807	5829	5828	5829
Health month before recoded	Correlation Coefficient	-.053**	-.002	-.055**	-.043**	.010	.029*	-.036**	-.129**	-.119**	-.067**	1.000	.112**
	Sig. (2-tailed)	.000	.856	.000	.001	.439	.026	.006	.000	.000	.000	.	.000
	N	6008	6018	5849	6020	5981	6020	5966	6008	5995	5828	6020	6020
age group	Correlation Coefficient	-.134**	.410**	.227**	-.011	.078**	-.019	.080**	-.178**	-.109**	.046**	.112**	1.000
	Sig. (2-tailed)	.000	.000	.000	.390	.000	.140	.000	.000	.000	.000	.000	.
	N	6009	6019	5850	6021	5982	6021	5967	6008	5996	5829	6020	6021

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Please note the variables listed for the final model of recovery expectation included all the variables also in the final model for return to work expectation

213 Heritage Medical Research Centre
University of Alberta, Edmonton, Alberta T6G 2S
p.780.492.9724 (Biomedical Panel)
p.780.492.0302 (Health Panel)
p.780.492.0459
p.780.492.0839
f.780.492.7808

HEALTH RESEARCH ETHICS APPROVAL FORM

Date: February 2008

Name of Principal Investigator(s): Dr. Linda Carroll

Organization: U of A

Department: Public Health Sciences

Project Title: An examination of global recovery and return to work expectation following motor vehicle accident

The Health Research Ethics Board has reviewed the protocol involved in this project and has been found to be acceptable within the limitations of human experimentation. The HREB has also reviewed and approved the subject information letter and consent form.

The approval for the study as presented is valid for one year. It may be extended following completion of the yearly report form. Any proposed changes to the study must be submitted to the Health Research Ethics Board for approval. Written notification must be sent to the HREB when the project is complete or terminated.

Special Comments:

Dr. Glenn Griener, PhD.
Chair of the Health Research Ethics Board
(B: Health Research)

FEB 13 2008
Date of Approval Release

File Number #B-070208

UNIVERSITY OF ALBERTA

Capital Health
Edmonton and area

CARITAS HEALTH GROUP